THE CHEMICAL AGE

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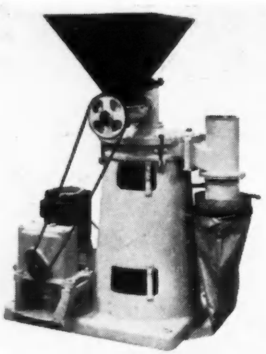

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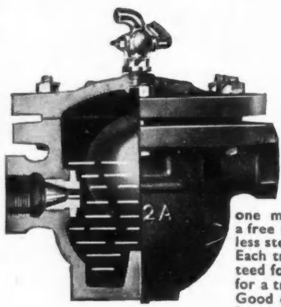

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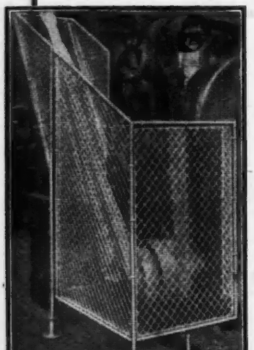

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IN THIS ISSUE

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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Utilisation of Coal

LAST week's Symposium on coal and petroleum held at Scotland's oldest university, dealt thoroughly with the methods which have been developed for using coal and petroleum for other than purely heating purposes. Some of the papers presented during this meeting are reported in this and previous issues and give many interesting facts concerning different processes for utilising these two raw materials. At the present stage in our national economy, however, it is wiser to view the question of the utilisation of our coal resources from the economic rather than from the purely chemical point of view.

The Fuel Research Board has estimated that the reserves of coal in Scotland alone amount to 9,620 million tons and that since the pre-war annual output was only of the order of 30 million tons—and is now less than that—we have enough Scottish coal to last for another 300 years. We therefore see that there is no immediate prospect of our running out of coal—the limiting factor at the moment is the amount of coal which can be brought to the surface. Since we cannot obtain all the coal we require at the present time it is only prudent that our limited stocks should be used to the best advantage. We may note in passing that of the annual coal production target of 200 million tons, 45 millions are for domestic purposes. No one will deny that this is an inefficient way to use coal but since the open fire is a symbol of British home life such a national extravagance is tolerated even if rationed.

Much has been written recently on the Fischer-Tropsch reaction, mainly owing to the discovery that it had been used by the Germans on a large scale during the war with great success. This is a versatile process and starting from a mixture of carbon monoxide and hydrogen either petrol or a range of aliphatic chemicals may be produced. Owing to our need to conserve dollars the importation of petrol has been restricted and it might seem at first sight that this reaction would relieve the shortage. Further inspection shows, however, that in order to make one ton of petrol five or six tons of coal are required and this, therefore, cannot be considered as a suitable process. It must be stressed that the economic consideration of any reaction must be made with a full understanding of local conditions. Whether a process is economic in Germany, Great Britain or the States are three completely different cases each to be treated on its own merits. This is illustrated firstly by the fact that 80 octane petrol may be made directly by a Fischer reaction in the States using their abundant supplies of natural gas, and secondly by the fact that in the States they use methane as a source of hydrogen while in this country we produce methane from coal.

It sometimes happens that a synthetic article may be more expensive than a product made from natural sources and at the same time less efficient. Clearly such an article will not command a ready sale if in competition with the natural product. A case in point was the production of soap in Germany by the Fischer reaction before the war. Even though this soap was not of very high quality it cost the equivalent of sevenpence a tablet. In the case of some of the newer plastic materials these have properties which are in some cases

On Other Pages

superior to the natural article and will, therefore, find a ready sale even if the price is on the high side. Such a compound is polythene, now universally accepted to be the best solid dielectric material and widely used in the manufacture of radio equipment and submarine cables in which it has replaced gutta-percha.

The production of synthetic petrol by the Fischer-Tropsch and hydrogenation reactions has been one of alternating supremacy and although some years ago the hydrogenation procedure was the only method capable of giving good quality petrol the position has now been reversed in the States owing to the development of a fluid iron catalyst and on account of their favourable situation regarding natural gas.

The profitable operation of any process depends to a large extent on the utilisation of by-products which, in the case of petrol production, comprises a gas containing large quantities of methane. Such a gas has a high calorific value and if this can be sold it enables petrol to be produced in the States at a cost of 7 cents per gallon, at which price it is capable of competing with the natural product, as against 9 cents per gallon if the gas is not utilised. The Germans also realised the importance of utilising any by-product gas and, in the operation of the Fischer reaction to give petrol, distributed a gas of 450 B.Th.U. over the Ruhr gas grid system. This had the effect of reducing the net amount of coal consumed to 4½ tons per ton of petrol, but even so this petrol was more expensive than the product obtainable from natural sources.

Those who are responsible for the planning of the coal industry should therefore encourage the use of coal for the manufacture of those products which have a high export value and at the same time consume comparatively little coal in manufacture. It would, therefore, appear to be more profitable from a national point of view to continue to import petrol from dollar areas and to use our present limited supplies of coal to build up a valuable export trade.

In 1937 the third report of the "Oil from Coal" Committee appointed by the Scottish colliery owners reported that of the various proposals for treating coal with the object of producing derivatives none warranted sufficient promise, from the business point of view, to justify economic exploitation. It has been made amply clear at St. Andrews, and on other occasions, that British research has developed many processes for using coal, just as the Americans have in the case of petroleum, and in the middle 1930's a British counterpart of the Fischer-Tropsch process was operated in Scotland. Despite the excellence of the process and the plant, the scheme failed owing to lack of Government support, although in 1936 the Scotland Development Committee urged the Government to back such an enterprise. It was very strongly urged at St. Andrews that in order to avoid such another failure a Government subsidy should be granted, at least for development work to be carried out.

In concluding the Symposium a resolution was passed that the Royal Institute of Chemistry should approach H.M. Government with a view to requesting them to set up a committee to investigate the chemical utilisation of coal, a step with which we are in full agreement.

NOTES AND COMMENTS

Fraternity

THE opening at the Central Hall, Westminster, on Tuesday of the centenary celebrations of the Chemical Society brought home with renewed force the realisation of a peculiar quality of chemical study, not altogether new perhaps, but seldom so conspicuously apparent. This concourse of nations—a little UNO, in fact —exhibited in a diversity of incidents what has so often been wanting in its much publicised prototype: a readiness of many races to give credit to each other's point of view and to acclaim achievements, regardless of creed, colour or language. This clearly is one of the special privileges of chemistry and if the science conferred on humanity no greater gift than this it would still have amply justified its existence. Of the many recollections borne away from Tuesday's ceremony the most lasting, we believe, will be of this remarkable spirit of fellowship, which the president, Professor C. N. Hinshelwood, acknowledged when he condoled with Mr. Ernest Bevin on having missed, through his duties in Paris, a practical illustration of the sort of results for which he strove elsewhere. To Mr. Bevin, in particular, the spectacle of a Russian scientist—M. Nesmeyanov—presenting fraternal greetings to England on behalf of Soviet scientists, and himself receiving almost an ovation from the audience would have served as a much needed antidote to the antagonisms which have been the dominant characteristic in the political sphere. We may be thankful for the testimonies given this week that in the disinterested realm of pure science there are still no national boundaries.

The Exhibition

IT was a happy thought that one of the events connected with the celebrations of the centenary of the Chemical Society should be an exhibition showing chemical progress in the past 100 years. The thanks of the chemists are due to the Government for allowing the exhibition to be held in that most appropriate place—the Science Museum. The exhibition itself is not large, but it is a most interesting collection of original apparatus and models and shows the achievements of British chemistry during the past century. The first part illustrates the great advances that have taken place, and includes many of the most famous objects in the history of British chemistry, collected from scientific institutions, the universities, museums and industrial bodies. Among famous chemists whose work is illustrated is Faraday, whose discovery of benzene in 1825 paved the way for the production of a host of new substances used in making dyes, drugs, perfumes and explosive materials. The romance of the discovery and preparation of artificial dyes is also shown, and includes Perkin's preparation of the first coal-tar dye "mauve," discovered in 1856. The story of the familiar electric sign, so much in use to-day, is taken back to pioneer work on the rare gases, of which the red "neon" light, discovered by Ramsay in 1898 is a spectacular example. The first preparations of artificial rubber are included and many other interesting objects in the history of chemistry during the past 100 years are shown. Each branch of chemistry has been under the care of a panel of experts composed of leading scientists of the day.

A Modern Section

A MODERN and popular section of the exhibition, prepared by the Department of Scientific and Industrial Research, deals with the applications of chemistry to everyday life. It includes sections dealing with such themes as textiles, agriculture, homes and buildings, roads and transport, fuel and power, health and food. Linking the two parts of the exhibition is a special display explaining the processes by which the chemical engineer turns raw materials into products familiar to everyone. The cooperation of the leading research associations has been secured for this part of the exhibition and the Central Office of Information has undertaken the design and layout. The exhibition constitutes one of the most comprehensive displays in the history of science yet seen in this country. In addition to providing information of interest to the more scientific visitor it serves, by means of its more popular exhibits, to emphasise to the general public the many benefits, and the far-reaching effects on their lives, resulting from the scientific discoveries of their countrymen.

Telling the World

THE Chemical Society has never courted publicity. From the viewpoint of the general Press its reticence is probably regarded as verging on the eccentric in an age when atom bombs and "flying saucers" are the staple stuff of headlines. No one this week, however, can fairly accuse the Society of shunning the Press or the public gaze, in view of the fairly ample and farseeing preparations it appears to have made to ensure the significance of its centenary celebrations and of the Congress of Pure and Applied Chemistry is widely recognised. The public in general is just now more keenly interested than ever before in the scientific background to daily life and is entitled to be told what value attaches in the present troubled picture of current affairs to this week's assembly in London of men of this country and 28 others whose achievements in the field of pure chemistry have made their names familiar, even though the importance of their contributions may not be generally appreciated. The Press conference conducted by Sir Wallace Akers on the eve of the congress and of the celebrations indicated that if the public at large does not receive a fairly ample and balanced picture of recent extraordinary progress in chemistry now being revealed after nine years' silence it will not be the fault of the organisers. In this connection it is as well to emphasise that the congress has put no ban on atomic energy papers, as was stated in an evening newspaper last week. The only restrictions on discussion of this subject are those embodied in the Atomic Energy Bill. Each of the sections of the congress has its "interpreter" qualified to answer questions and elucidate various points raised by the papers. British chemists have certainly done their best to ensure that this and next week's events are not run on the "closed shop" principle and that those who are not chemists share as far as is possible in the exchange of chemical news. Good psychology, in this connection, was the decision to open the centenary exhibition at the earliest opportunity—July 20—to the public at large. It should help to widen chemical perspectives the easy way.

B.I.O.S. REPORTS ON JAPAN

A NUMBER of short reports of five to eight pages each have recently been issued by H.M. Stationery Office on several Japanese chemical companies. These reports, which originate from the Military Intelligence Section, G.H.Q., Supreme Commander for the Allied Powers, although containing a useful array of facts and figures relating to the history, ramification, and annual production of particular targets, are by no means as lucid and comprehensive as those written by expert teams on the German chemical industry.

The Electro-Chemical Industrial Co., Ltd., Tokyo, is stated to be producing cyanamide at an annual rate of 110,000 tons, but is expected to increase its output to 160,000 tons after the installation of nitrogen separators. It is said that plans have been made for producing cement and sulphanile products. When the report on the Tokuyama Soda Co., Ltd., was being prepared, the company's operations were at a standstill because of bomb damage, but it is thought to be capable of resuming work when materials and fuel become available. The company—one of four making soda by the ammonia process—also manufactures soda ash, common salt, calcium chloride, sodium silicate, gypsum and cement. The absence of reference to improved processes and techniques, or remarks on the efficiency of the plants visited, manufacturing costs, welfare and safety arrangements would seem to indicate that little information of importance has been gained.

Industrial Paints on Test

A PAINT research programme which is capable of saving much expenditure on maintenance in the U.S.A., is being carried out by the Dow Chemical Co., and Sherwin-Williams, at Freeport, Texas. Originally, the intention was to find the most suitable paints for exteriors for Dow's large chemical plant at Freeport, but the results may be of general application in the chemical, petroleum, and other industries.

The paints used hitherto have not withstood satisfactorily the severe conditions attending the production of bromine, magnesium, synthetic rubber, and ethylene products. Whereas the ordinary life of industrial paints under average conditions is about five years, few of those used at Freeport had lasted longer than twelve months.

Some fifty different primers and finishes are being tested on 1500 paint-outs and test panels in ten different areas, subjected to controlled and characteristic chemical and atmospheric conditions.

CHEMICAL SOCIETY CENTENARY

Exhibition—Reception—Centenary Address—Dinner

THE three days of ceremonies to celebrate the 100 years existence of the Chemical Society began in grand style on Monday morning when an exhibition showing the principal events in the chemical history of the last 100 years was opened by the president of the Society, Professor C. N. Hinshelwood, at the Science Museum.

The Minister of Education, Mr. G. Tomlinson, in asking the president of the Chemical Society to declare the exhibition open, said :—

I am delighted to welcome here the Fellows of the Chemical Society and their colleagues, who are here to celebrate the Society's centenary. All birthday parties are happy occasions; but learned societies have the advantage over human beings that, whereas the latter at their centenary may be excused if they face the future with speculation, tinged perhaps with anxiety, the former have no such fears and are only beginning to enter on their full vigour as they enter on their second century of existence. The older, like so many good things, the stronger and the better.

The 1840's were a vintage decade for the expansion of knowledge. A few weeks ago I had the privilege of entertaining in this museum the Institution of Mechanical Engineers at their centenary. To-day you are here as my guests on a similar occasion. It is fitting that the two events should so nearly coincide, for together engineering science and chemical knowledge represent two of the foundation stones on which the greatness of Great Britain as an industrial power was built, and on which it must continue to stand if—as it will—it is to retain and reinforce its economic and moral pre-eminence in those activities whose wise application to the problems of the world can mean so much in terms of human welfare.

Sir Robert Robertson, Mr. G. Tomlinson (Minister of Education), and Professor Hinshelwood at the Exhibition

Professor C. N. Hinshelwood. President of the Chemical Society

It is a very happy augury that, together with your centenary celebrations, the 11th International Congress of Pure and Applied Chemistry should be taking place in London. Knowledge recognises no frontiers, and this is one of the occasions when we can see this truth in reality. The Chemical Society counts over 7000 Fellows all over the world. To the congress there have come delegates from almost every country. Here in this gathering is the expression of international friendship and co-operation at its best. It serves no narrow national purpose; it pursues knowledge in a spirit of friendly rivalry and with a deep sense of its responsibility to the peoples of the world. When the nations can work at the political level in the same unselfishness and zeal for a common purpose as your Society, and others like it, show for the advancement of learning, then the world will at least be on the way to the kind of society which we as members of the United Nations, through UNESCO, and the other specialised agencies, are trying to build.

The learned societies play a part in the cultural and intellectual life of the community, not only important but in a true sense vital. Not only do they represent both the advance guard of the human spirit, continually probing the frontiers of new knowledge by their researches, but they stand also, as it were, at the pinnacle of the educational pyramid, which begins in the primary school. To that pinnacle we are determined to make it possible for every boy and girl, if their desires and abilities can lead them in that direction, to aspire. In this pattern, and especially at its higher levels, teaching and research are inextricably linked. I count it of the first importance that those who teach at those levels should periodically refresh their minds and their knowledge by undertaking original research.

Upstairs in the present exhibition you can see some of the landmarks in the progress of your science in this country during the 100 years for which your Society has existed. Beyond everything else it teaches how closely the search for new facts is related to the more day-to-day things which form the background of our daily lives. In very truth the chemical adventurers of yesterday are the fathers of the chemical industries of to-day. We need look no further than the list of presidents of the Chemical Society, chosen by earlier Fellows for their ability for leadership in chemical research, to realise this truth. The names of men like Sir William Perkin, Lawes, Gilbert and Sir William Ramsay testify to it. I know that this line will continue with yet greater distinction.

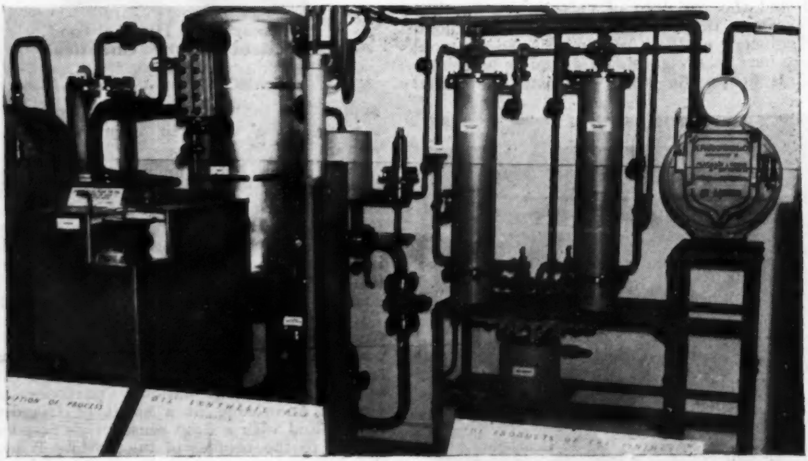
In 1841, when the Chemical Society was founded, Thomas Graham, Professor of Chemistry at University College, London, was your first president. In 1847 he was again president of your Society. Nothing could be more fitting and nothing could give me more pleasure than that I should now ask his successor, that very distinguished scientist, Professor C. N. Hinshelwood, the president of your Society in its centenary year, formally to declare this exhibition open.

In opening the exhibition, Professor Hinshelwood said:—

I must first, on behalf of the Chemical Society, thank the Minister very much for the courtesy to the Society in receiving us here and for the stimulating words which he has said to us.

An exhibition is defined as a display of objects of beauty or interest. I must thank the director and staff of the Science Museum for what they have done.

Referring to the fact that to derive full benefit from the exhibition we



A Modern Plant on show at the Exhibition.

The experimental plant used by the Department of Scientific and Industrial Research for the synthesis of oils by the Fischer-Tropsch process. By this process large yields of oil are obtained from coal without the use of high pressures. Motor spirit and diesel oils are obtained directly, and lubricating oil can be prepared from the synthesis product

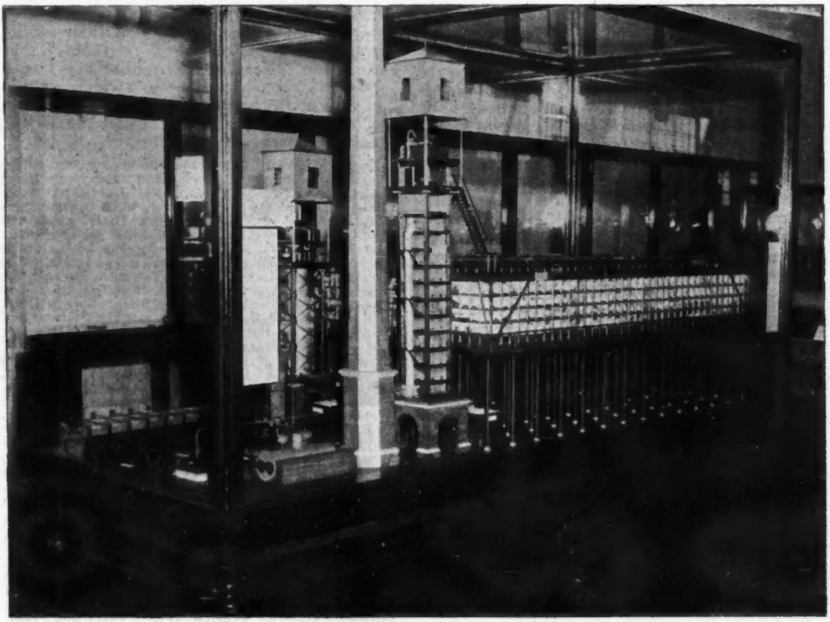
must rely essentially upon the associations which those objects have for us, Professor Hinshelwood said the only real person to write up this exhibition would be Hans Anderson. What conversations he would have made these objects have among themselves. We must let our fancy play over the exhibition, and we shall have the whole history of chemistry evoked for us.

One section of the exhibition is devoted to the relation of chemistry to our daily lives. This will have a more immediate appeal to the public in general. It will show them what they owe to chemistry in matters of health, amenities and every aspect of their daily lives. It is fair to point out that anything which has been derived in that respect would never have existed without the rather recondite and obscure-looking objects which are displayed in the historical section. Books are also displayed. They are the very lifeblood of science. It is a rather sad reflection of the times that we now come to museums to see the books which we used to buy.

All the great advances of the last century came from men with independent vigorous minds. The machine with which we now have to work is enormously powerful, and we hope it will yield greater results. But it will still be the originality and independence of men's minds which will determine what happens. In response to the kind invitation of the Minister, I declare the exhibition formally open.

Sir Robert Robertson, chairman of the Exhibition Committee, thanked the Minister and staffs of the Chemical Society and the Science Museum for their work in connection with the exhibition.

Mr. Tomlinson, replying to the thanks, referred laughingly to the fact that it was a Monday morning and he had not thought it possible to gather so many people together to visit an exhibition on that day. Speaking on the book section of the exhibition, he said we produce so many books and so few people read them—and that goes for Government circulars, too!



A Model of an old sulphuric acid plant. This was put up in 1866 to produce chamber acid of 60-70 per cent H_2SO_4

World Honours the Chemical Society

THE ceremonial opening at Westminster on Tuesday of the centenary celebrations of the Chemical Society afforded most impressive evidence of the integrity of chemistry and of chemists, which seems to be secure in the face of all disruptive influences —different languages and conflicting social and political "ideologies." This, even more than the dignified pageantry of the processional entry of the delegates, led by the president of the Chemical Society and the mace bearer, was the predominant impression.

The president of the Chemical Society, presiding over the ceremony, was evidently as conscious as the audience that this spirit of international solidarity in one field at least was fully as important as anything else the celebrations and the chemistry congress can hope to achieve, and he summed up very appropriately what was in everyone's mind when he said regretfully that Mr. Ernest Bevin's preoccupations in Paris alone had prevented him being there "to see the sort of results for which he strives."

International Recognition

In addition to the cosmopolitan character of the participants and spectators, suggesting a full meeting of UNO rather than an incident in one country's affairs, there were other convincing evidences of the temporary obliteration of nationalistic prejudices and of the honour in which the society is held by chemists all over the world. The presentation of written addresses by the representatives of learned societies of more than 30 countries and of a long verbal address in warm terms by Professor R. Delaby on behalf of the Société Chimique de France, were the most impressive. In addition, several countries, feeling perhaps that the cordiality of their feelings could not be adequately conveyed on a parchment, accompanied their addresses with gifts to the society—from Sweden a magnificent example of Swedish glass inscribed with chemcal symbols and with the name of the Chemical Society, from South Africa an inkstand of decorative stinkwood.

From H.M. the King came a personal message, read by the president, sincerely thanking the Council and Fellows of the Chemical Society for their kind and loyal message and recording the King's appreciation of the work which the society is doing for the common good.

Greeting the delegates, who with their friends nearly filled the spacious ground floor of the Central Hall, the president recalled the formation of the society just over 100 years ago by 25 chemists led by Robert Graham, who would, he surmised, be surprised to see to-day the size to which their enterprise had grown. It was his privilege to welcome delegates from all over the world, who were tangible evidence of the unity of science in all countries. This suggested that when people had something worth while to occupy them they could live and work together in amity. In greeting the overseas delegates he felt he was welcoming old friends, and it was gratifying to record that that day in Peru the Chemical Society of Peru was holding a meeting, at which the British Ambassador would be present, in honour of the centenary of the British Chemical Society.

Sir Robert Robinson, expressing, as president, the greetings of the Royal Society, spoke also on behalf of the other learned societies having close associations with the Chemical Society. It was noticeable, he said, that many of the societies now presenting addresses owed their parentage to the Chemical Society, a special case being that of the Society of Dyers and Colourists, which was now reaching its manhood and was seeking a charter. There was no better example of the devoted endeavours of the Chemical Society. The most lively gratitude also was felt by individual chemists, who looked on the society "as their mother and father." On behalf of them he assured the society of "our filial devotions."

Congratulatory addresses, which will be on view at Burlington House, were presented by representatives of the following British organisations:

The Royal Society (Sir Robert Robinson), The British Association for the Advancement of Science (Sir Henry Dale), The Cambridge Philosophical Society (Dr. W. H. Mills), The Faraday Society (Prof. W. E. Garner), The Geological Society of London (Prof. H. H. Read), The Institute of Brewing (Mr. B. M. Brown), The Institute of Metals (Col. P. G. K. Gueterbock), The Institution of Chemical Engineers (H. W. Cremer), The Institution of Electrical Engineers (Mr. V. Z. de Ferranti), The Institute of Metallurgists (Dr. H. Moore), The Iron and Steel Institute (Prof. T. Turner), The Linnean Society (Prof. G. R. de Beer), The Manchester Literary and Philosophical Society (Mr. H. Hayhurst), The Mineralogical Society (Dr. W. Campbell Smith) The Oil and Colour Chemists' Association (Dr. H. W. Keenan), The Pharmaceutical Society (Mrs. J. K. Irvine), The Physical Society (Prof. G. I. Finch), The Royal Astronomical Society (Mr. D. H. Saddler), The Royal College of Surgeons (Sir Alfred Webb Johnson), The Royal Entomological Society (Dr. C. B. Williams), The Royal Institute of Chemistry, The Royal Institution (Prof. E. K. Rideal), The Royal Photographic Society of Great Britain (Dr. H. Baines), The Royal Society of Arts (Sir Harry Lindsay), The Society of Chemical Industry (Dr. L. H. Lampitt), The Society of Dyers and Colourists (Dr. C. A. Whittaker).

FROM OVERSEAS

Addresses from overseas societies were presented by the following:—

Asociacion Quimica Argentina (Dr. Venancio Deulofeu), Australian Chemical Institute (Dr. H. H. Hatt), Société Chimique de Belgique (Prof. J. Timmermans), Chemical Institute of Canada (Dr. Paul E. Gagnon), Chinese Chemical Society, Nanking (Prof. Fan-Hsuin Lee), Sociedad Colombiana de Ciencias Naturales (Dr. A. E. Alston), Ceska Chemicka Spolecnost (Prof. J. Heyrovsky), Kemisk Forening, Copenhagen (Dr. H. Jorgensen), Royal Irish Academy, Dublin (Prof. T. S. Wheeler), Irish Chemical Association (Dr. V. C. Barry), Fouad I

National Research Council (Dr. Ahmad Bey Zaki), Suomen Kemist Seura, Helsinki (Baron John Palmen), Société Chimique de France, Paris (Prof. R. Delaby), Société de Chimie Industrielle (M. Robert Bienaimé), The University of Salonika, Society of Icelandic Chemists (Dr. Björn Johannésson), Societa Chimica Italiana (Prof. D. Marotta), Indian Chemical Society, (Dr. S. Krishna), Nederlandsche Chemische Vereeniging (Prof. J. Coops), Flemish Chemical Society (Prof. B. Breckpot), New Zealand Institute of Chemistry (Mr. P. White) Norsk Kjemisk. Selskap, Oslo (Prof. E. Berner), Sociedad Quimica del Peru (Señor Morales Macedo), Polish Chemical Society, (Prof. O. Achmatowicz), Chemical Society, Stockholm (Prof. H. Erdtman), Royal Swedish Academy of Sciences (Prof. G. de Hevesy), Swiss Chemical Society (Prof. P. Karrer), The Chemical, Metallurgical and Mining Society of South Africa, South African Chemical Institute (Dr. W. E. Gooday), American Chemical Society (Dr. W. A. Noyes and Col. M. T. Bogert), The Chemical Society of Uruguay, The Soviet Academy of Science (M. Nismeyanov), and the Croatian Chemical Society.

Centenary Address

Prof. C. N. Hinselwood, president of the Society, delivered the Centenary Address before an enthusiastic gathering at the Central Hall, Westminster, S.W.1, on Tuesday at 3.30 p.m. He gave an historical survey of the Society's activities since its formation in 1841, mentioning the great financial difficulties encountered in the early days and the not always helpful need for direction and secrecy of recent years.

The Prime Minister, the Rt. Hon. C. R. Attlee, was the guest of honour at the Centenary Dinner held at the Dorchester Hotel, London, on Tuesday evening.

The Minister of Education looking at the exhibition penicillin stand

ITALY SHORT OF CUPRO CHEMICALS

CONSIDERABLE delay in the arrival of copper supplies in Italy have reflected unfavourably on the production of copper sulphate. Fungicides should have been at the disposal of farmers in May, but the factories began receiving their copper only in April. This has led to considerable increase in prices which went as high as 130,000 lire per ton at the beginning of June. At present, however, the output has resumed a certain regularity and is forcing the price down.

The situation with oxide-chloride of copper powders needed in fruit and especially in grape culture, is worse, for the output is not likely to exceed 3000 yearly tons and no more than 33 per cent of the pressing demand can be satisfied. The same applies to the production of copper-sulphur compounds used against wheat-rot.

St. Andrews Symposium

CHEMICALS FROM COAL AND PETROLEUM

Summing Up of the Papers

By a Special Correspondent

DURING the week July 7-12 over 200 members of the Royal Institute of Chemistry gathered at the University of St. Andrews to attend a symposium on "Coal, Petroleum and their Newer Derivatives." The symposium was organised by a committee of the three Scottish local sections of the Royal Institute under the chairmanship of Dr. David Traill with Mr. A. R. Jamieson as secretary. The committee is to be complimented on arranging and carrying out such an ambitious and entertaining programme.

The symposium was opened by the Principal, Sir James Irving, and his remarks together with a review of some of the papers have been given in THE CHEMICAL AGE (July 12, p. 39).

Synthetic Petroleum Production

The first paper to be presented was by Major Kenneth Gordon, of the I.C.I. Billingham Division, on "The Production of Petroleum by Synthetic Methods." In his opening remarks the speaker said that there are two main methods for the production of petrol; either from coal by breakdown or by a synthetic process of the nature of the Fischer-Tropsch method. In the case of the production from coal it was essentially a case of direct hydrogenation since the empirical formula of coal is $CH_{0.5}$ while that of petrol is CH_2 and the process resolves itself into a means for introducing the extra 1½ atoms of hydrogen, which is normally done under a pressure of 250-300 atmospheres.

Owing to the difficulties of introducing a solid into high pressure apparatus, if coal is to be used as the raw material it is powdered and mixed with oil to give a paste from which the oil may be recovered by recycling. Although coal has been used as the raw material at Billingham it has now been superseded by creosote oil and tar, as the coal caused great abrasion of the plant and also during the war it was safer to carry out emergency shut-downs in case of air attack with an all-liquid feed. When coal is used as the raw material it is washed by flotation in order to reduce the ash to a minimum. Owing to the heterogeneous nature of coal about 5 per cent avoids hydrogenation, although this figure may be increased if the coal is alkaline since alkalis have an adverse affect on hydrogenating processes. As the removal of any unhydrogenated material is a difficult operation it is usual to treat the coal with a small excess of hydrogen chloride—introduced as ammonium chloride—to reduce this tendency to a minimum.

The ideal method of hydrogenating coal is to use four stages, although a satisfactory product may be obtained using two, while at Billingham three stages are employed. In the initial stages the catalysts employed in the hydrogenation are tin oxide and iron sulphide while in the final stage tungsten sulphide is used as this is a very active catalyst.

Petrol consists mainly of pentane and some butane, and providing hydrogenating conditions are not too drastic only a small percentage of lower hydrocarbons is formed. When coal or tar oils are hydrogenated it is found that the fraction boiling up to 180°C. is purely hydrocarbon in character while above this temperature phenols and basic substances are obtained. The yield of petrol from coal will depend on the type of coal used and the quality of the petrol required. On an average, bituminous coal will give about 50 per cent conversion although this figure will be slightly increased if the petrol is for motor spirit, and lowered if for aviation spirit. German plant during the war had an annual output of 4 million tons of petrol while the combined output of Billingham and Heysham is half a million tons. Petrol obtained by this method has, without special treatment, an octane number of 80 which, by the addition of lead, may be increased to 95. In order to get an octane number of 100 iso-octane must be added.

Major Gordon pointed out that the immediate prospects for this type of process are less favourable than they were 20 years ago mainly owing to the large increases in the cost of coal and labour coupled with the fact that the petrol sold to-day is of a higher quality than formerly. Finally, the speaker dealt with the synthetic aspect by the Fischer-Tropsch reaction.

Synthetic Fibres

Since one of the greatest technological advances in the last few years has been the production of synthetic materials from coal tar chemicals it was fitting that Professor Astbury should be invited to speak on the "Evolution and Physical Interpretation of Synthetic Fibres." Members were intrigued by the first two slides which showed a section of a worm's skin under a microscope and an electron microscope, and these were used as examples of the highly symmetrical nature assumed by fibres in natural materials.

From this introduction the speaker showed, by means of many illustrated examples, how X-ray diagrams can be used to determine the orientation existing in synthetic fibres. He pointed out that complete irregularity gives pliable properties and this is only required for india rubbers, while too perfect orientation of the molecules gives a brittle nature. A successful plastic must therefore have an intermediate measure of orientation which will give it the optimum properties.

It was mentioned that the strength of fibres is largely due to chemical forces and that the strength of nylon can be attributed to the optimum conditions which exist for the formation of hydrogen bonds between carbonyl and amino groups in adjacent molecules, since both the acid and the amine used have an even number of carbon atoms.

Gasification of Coal

On the second day, Dr. D. T. A. Townend, Director of the British Coal Utilisation Research Association, gave an account of modern coal gasification developments. In view of the large number of different processes in use, he confined his remarks to the Lurgi process as being typical of a pressure-operated process. In such a plant the recovery of products is about 73 per cent coke, 18 per cent gas and 5 per cent tar.

Carbonisation means heating coal in a retort, and since the constructional materials and the coal are both bad conductors of heat this is wasteful. Gasification uses internal heat normally by burning part of the charge with air or oxygen. In the production of water gas it is now possible to combine the blow and make runs by using steam mixed with oxygen instead of air. Two main reactions may occur according to the temperature :—

(a) $C + H_2O = CO + H_2 - 29$ cal.

(b) $C + 2H_2O = CO_2 + 2H_2 - 19$ cal.

Reaction (a) occurs at 1100°C. and (b) at 600°-700°C. It is therefore essential to keep the temperature of the bed at 1100°C. since a lower temperature will result in the loss of calorific value of the gas owing to the high CO_2 content, while higher temperatures will reach the fusion point of the coal and cause clinkering. The temperature may be regulated by the rate of steam flow.

Methane by Direct Hydrogenation

Working at a pressure of 20 atmospheres increases the amount of methane, which is formed by a direct hydrogenation of the coal and not by synthesis, and this gives a higher calorific value to the gas; it also enables any CO_2 to be removed by scrubbing with water. Such treatment gives a uniform gas independent of the type of coal used. Since the Lurgi process goes best with coals of the lignite type, certain British coals need pre-treatment to prevent caking.

Dr. Townend also described how the Lurgi process may be operated to produce synthesis gas for use in the Fischer-Tropsch reaction which was then described by Dr. C. C. Hall, in the next paper, who dealt with its application to the production of a variety of synthetic products.

Since no industry can continue without power of some kind, it was appropriate that the symposium should be addressed by Mr. A. E. MacColl, deputy chairman of the North of Scotland Hydro-Electric Board. This speaker told the meeting that there was now a Government plan in hand for the provision of hydro-electric power in Scotland which ultimately would entail the building of about 200 power stations, and it was hoped that there would be an extra million kilowatts of electrical energy available by 1957.

Chemicals from Petroleum

An introductory contribution concerning conditions in the States was made by Dr. Gustav Egloff, of the Universal Oil Products Co. In his paper, Dr. Egloff told members that while in 1925 petroleum provided less than 0.1 per cent of the organic chemicals made and that in 1935 only one oil firm was registered as a chemical producer, these figures had risen in 1946 to 28 per cent and 50 per cent respectively. Of the 1700 million barrels of oil produced annually for heating, light and power, the use of less than 1 per cent made possible the production of 3800 million lb. of organic chemicals (excluding aromatic hydrocarbons). He then outlined the many substances of commercial importance which are now produced from petroleum and mentioned a new synthetic rubber known as "butyrubber" which he considered would be used in future for the inner tubes of tyres as it has only one-twentieth the porosity to air of natural rubber.

Plastic Materials

On the third day, which was devoted to chemical syntheses, the chair was taken by Professor Read, of the University of St. Andrews, and the first speaker was Professor E. R. H. Jones who outlined the recent advances in the chemistry of acetylene (details of this were given in last week's issue of THE CHEMICAL AGE).

Following this came Mr. Brown, of the I.C.I., Ltd., whose subject was vinyl compounds. This speaker dealt mainly with the production of the monomers from which such plastics are made. He showed the various ways in which such compounds as styrene, vinyl esters and acrylates could be made industrially, and stressed the fact that many of the processes depended upon

acetylene as starting material. (This paper will be given fully elsewhere.)

Dr. R. Hill, of the I.C.I., Ltd., gave an account of the way in which nylon and similar compounds are made. In his talk he mentioned the necessary criteria for suitable monomers and the properties that an artificial plastic should have to render it of general use.

Dr. J. C. Swallow, of I.C.I., Ltd., in concluding this day's lectures, dealt with polythene. He stressed the point, as had also the previous speakers, that all these synthetic materials were of comparatively recent introduction and illustrated this by saying that in the case of polythene the first small-scale production unit went into operation on September 1, 1939, although more is now known about this material than some of the older plastics. He also made the point that the large-scale production of polythene, necessary during the war for radar equipment, had meant a great improvement in gas analysis apparatus and instrument control.

Polymers

The last group of lectures, under the chairmanship of Professor W. F. K. Wynne-Jones, dealt with the physical properties of polymers. The first speaker was Professor M. G. Evans who discussed the kinetics of polymerisation. He confined his remarks to compounds of the mono-substituted ethylene type, since most was known about this class of compound and for which a sound theory had been proposed.

Dr. Per-olof Kinnell, of Upsala, described recent methods for determining the molecular weight of high polymers. In addition to the ultra-centrifuge, he showed how osmotic pressure measurements may be extended to substances of high molecular weight by the use of a balance, and briefly mentioned the light scattering method introduced by Debye in 1943.

The last paper to be presented was by Professor Brønsted, of Copenhagen, who discussed the energetic properties of hydrocarbon mixtures and indicated how, by a thermodynamic study of the solubility of one hydrocarbon in another, an estimate might be formed of the percentage of crystallites in a sample of polythene.

On the final day there was a lively discussion on the week's papers when the economic implications of modern trends in the use of coal were stressed. This was followed in the afternoon by a visit to Comrie Colliery.

No account, however brief, of the symposium would be complete without a mention of the social side, which included lectures and conducted tours of St. Andrews and district, kindly arranged by members of the university, an informal reception by the city authorities and a formal dinner at the Grand Hotel.

Iron and Steel Figures Rise

A GOOD revival of iron and steel output in the second quarter of this year is shown in the recently issued figures. The total of steel ingots and castings, which is equal to an annual rate of 12,694,000 tons, compares with an equivalent of 11,231,000 tons a year in the first quarter. Considerable acceleration of production would, however, be needed to reach the average of 13,111,000 recorded in April-June, 1946.

Announcing these figures, the British Iron and Steel Federation stated that the higher rate of output in recent months has been achieved only at the cost of continued withdrawals from stocks of pig iron and steelmaking materials. The maintenance or increase of the level of steel production depends on increased supplies of coal.

Reports from Workington show that output of hematite pig iron in the north-west is now over 14,000 tons weekly and is expected soon to reach 15,000 tons. It has been made possible by the recent better supplies of coke. Output, it is estimated, could still be doubled without oversupplying the market.

Society of Chemical Industry

THE 66th annual meeting of the Society of Chemical Industry, to be held at the Connaught Rooms, London, will this year extend over four days, *i.e.*, from July 28-31 inclusive. Among the highlights of a comprehensive programme will be the president's commentary, "Ourselves and World Chemistry," at noon on July 29, and two simultaneous scientific meetings at 2.30 p.m. on July 30, one organised by the Agricultural Group and the other by the Plastics Group. A ladies' theatre visit has been arranged at Drury Lane for the same time. At 10 a.m. on July 31 there will be a scientific meeting organised by the Chemical Engineering Group.

In its report the council expresses the Society's warmest thanks to Dr. L. H. Lampitt who was elected president last year. Emphasis is given to his many years of service to the Society in various capacities. The council adds that it is quite sure "the direction of its affairs is in good keeping. Membership of the Society for the year ended December 31, 1946, rose from 6667 to 7077.

LARGE-SCALE PRODUCTION OF OXYGEN—IV*

Reducing Costs of Turbine Methods

by DAVID D. HOWAT, B.Sc., Ph.D., F.R.I.C., A.M.I.Chem.E.

THE expansion turbine is employed with considerable success to achieve a given amount of refrigeration in the large modern Linde oxygen plants, but this is generally a secondary or auxiliary application of the machine.

The important feature of the work carried out by Kapitza is the employment of the high-speed expansion turbine to provide all the cooling of the air, with a pressure drop of only about 5 atmospheres. Because of the low operating pressure, the cooling effect produced is only 40 to 50° C. in place of the 130° C. characteristic of the Linde cycle. In view of the new and improved design of the Kapitza turbine it is claimed that these disadvantages attendant upon the use of low pressures may be eliminated. Further, the employment of the newer type of heat exchangers has led to a great improvement in technical efficiency.

Turbine Design

In essence the Kapitza turbine is based upon a design that in the past has been used only for water turbines, the blades being arranged between a pair of rotating discs. Directed radially inward to the turbine, the air flow passing the blades is deviated, leaving the turbine in the direction of the axis. In an effort to avoid the use of a multi-stage turbine with several rows of moving blades, Kapitza developed an extremely high speed rotor, making about 40,000 r.p.m.

Kaptiza claims[3] that his calculations show that owing to the high density of the air the dimensions of an expansion turbine must be kept small. A turbine handling 500 to 1000 cu. m. of air per minute (18,650 to 35,300 cu. ft.) at N.T.P. is fitted with a rotor only 8 cm. in diameter weighing 250 gms. With these small turbines it is difficult to give the blades the most favourable shape, straight blades being chosen for simplicity. Fig. 6, taken from Kapitza's paper[3], shows the design of the turbine.

To secure satisfactory thermal insulation of the bearings and to reduce losses the rotor is mounted on the free end of a flexible De Laval shaft, the other end of the shaft being supported by two bearings. Owing to the small dimensions of the expansion turbine the rotor must be constructed with great accuracy and must be very carefully balanced in view of the very small clearance between the rotor and the cover. Ensuring the necessary stability of the rotor involved considerable difficulties. A special damper, (Fig. 7), designed for use on the rotor, proved quite successful and with a clearance of 0.3 m.m. at the circumference of the rotor no mechanical contacts with the cover occurred, even with peripheral speeds of 180 m. per sec.

Two further points may be noted with reference to the rotor. First, to prevent the air flowing past the blades, two labyrinth glands (4 in Fig. 6), are provided, with a clearance of 0.15 m.m., the glands being of equal size at both ends to avoid axial pressure on the bearings. Second, the rotor shaft is mounted on ball bearings lubricated by drip. To reduce side pressure on the bearings as much as possible the rotor is fitted freely on the shaft, being able to move about its centre of gravity round the spherical end so that the principal axis of inertia automatically takes the direction of the axis of rotation. This free-

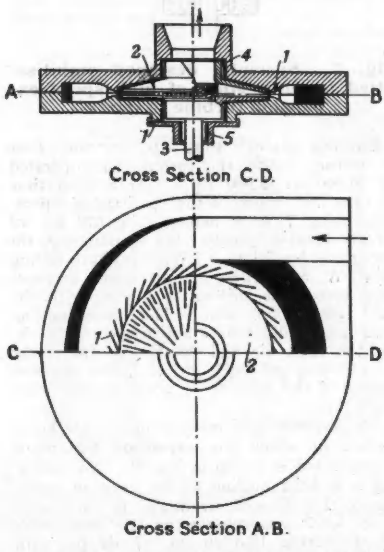


Fig. 6. High speed expansion turbine for liquefaction of air (KAPITZA)

* Parts I, II and III appeared on June 7, 14 and 28.

dom is limited by friction so that any accidental disturbances or vibration will be immediately damped by the stabiliser.

No useful work is wasted by the expansion turbine, the work being absorbed by a water-brake consisting of a small short circuited centrifugal pump with an adjustable intermediate orifice. This pump produces a pressure of 30 to 40 atmospheres, the pressure being read on a gauge, which in turn serves to indicate the speed of the rotor shaft.

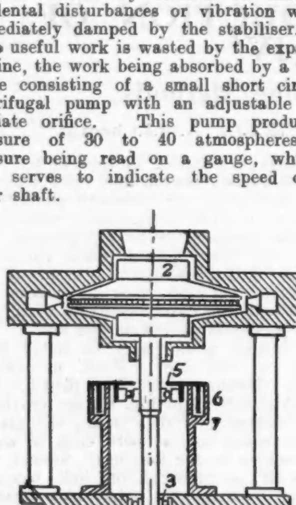


Fig. 7. Specially designed stabiliser fitted to rotor shaft of high-speed expansion turbine (KAPITZA)

Kapitza states[3] that up to the time of writing (1939) the turbine had operated at 40,000 to 42,000 r.p.m. for a total time of over 700 hours, actual periods of operation being 7 to 8 hours while 570 kg. of air are treated hourly. On starting up, the turbine is loaded to 8 kW. the figure falling to 4 kW. at working temperatures. Pressure drop across the turbine is 4 atm. with the inlet air at 5.6 atm. The corresponding temperature differences are given as 115° K. for the inlet air and 86° K. for the outlet air, a drop of only 29° K. The thermal output of the turbine is given at 3720 cals. per hour.

The experimental installation for air liquefaction in which the expansion turbine is incorporated is shown in Fig. 8. The following is a brief outline of the cycle of operations. The filtered air intake is compressed to 6 to 7 atmospheres in the compressor (2) delivering 13.3 cu. m. of air per min. at 500 r.p.m. After passing through a water-cooler and oil-purifier (3 and 4) the stream of compressed air enters the exchangers (6), the cycle in the exchangers being 25 to 27 secs. The exchangers are of exactly the same type as those designed by Frankl.

The stream of cooled air from the exchangers is then divided into two parts. The major portion, after passing the filter and temperature equaliser (8) enters the expansion turbine (9) where it expands and then returns by the inner tubes of the condenser (10) to the other exchanger, escaping thence to the atmosphere. The other, smaller, portion of the compressed air stream is delivered through a check valve (11) to the condenser (10) where it liquefies. Liquid air is drawn off through a valve (12) into container (13), whence finally it is drawn off through tap (14). Any air evaporated on its passage to the condenser joins the flow leaving the turbine, its cold being utilised for the liquefaction of fresh intake of air.

Insulation

As is evident from Fig. 8, the condenser and liquid air container are insulated by a common vacuum insulation, a similar type of insulation being provided for the temperature equaliser (8).

Water for the cooling of the water-brake on the shaft is supplied under constant pressure from a tank (15). Rate of flow of the water is independent of any fluctuations in the main and the estimate of the output of the expansion turbine becomes more precise.

A certain degree of trouble arises from the blocking of the nozzles of the expansion turbine due to the deposition of solid carbon dioxide. The accumulation takes quite a time but as the cross-section of the nozzles is only 1 to 2 sq. m.m. even a very thin layer of solid carbon dioxide will seriously reduce the cross-section and impair the work done. The resulting rise in pressure may vary from 1 to 1.5 atmospheres.

This troublesome effect may be dealt with in two ways: (a) by the employment of a temperature equaliser. The partial pressure of carbon dioxide vapour is an exponential function of the temperature so that the concentration of carbon dioxide increases considerably in the temperature interval. In consequence, carbon dioxide enters the turbine practically only during the time when the temperature of the air leaving the regenerators attains its highest value.

These temperature fluctuations must therefore be reduced and it was found possible to make use of the heat of absorption of charcoal or silica gel for this purpose. A few kilograms of charcoal will suffice to equalise the temperature. With the reduced temperature fluctuations, only small amounts of carbon dioxide are deposited in the nozzles. For several hours the effect on the working of the turbine is not serious

but the delivery of liquid air drops by several kilograms;

(b) By the employment of an electric heater. It is found more expedient to employ an electric heater intermittently than to utilise the temperature equaliser continuously. As soon as the pressure in the nozzles exceeds a certain definite value the air stream is diverted through by-pass (19) (Fig. 8), the flow to the turbine ceasing almost completely. At the same time the electric heater (17) comes into operation. Heating of the air continues for about 3 to 4 minutes and the warmed stream of air is passed through the turbine, evaporating the carbon dioxide. After this period the air is switched back to the main flow pipes and normal working is resumed. It is found that by-pass heating of the air becomes necessary at intervals of 1½ to 2 hours.

Pressure Losses

Kapitza states[3] that 29 to 30 kg. of liquid air are produced per hour on cycles of 7 to 8 hours operation (starting periods excluded). The air consumption is 9½ to 10 cu. m. per minute and the pressure drops. Thus, if the efficiency of compression is 0.59 the energy required for 1 kg. of liquid air is 1.7 kWh. Of the 7 atmospheres pressure drop 4 are taken up by the turbine, the remainder being wasted in the piping and exchangers. Accounting for these losses in the piping the power consumption is reduced to 1.3 kWh. per kg. of liquid air.

Further, in view of the fact that 0.85 of the output of the expansion turbine may be recovered in the form of useful work, the power consumption will work out finally to 1.2 kWh. per kg. of liquid air. By perfecting the thermal insulation and reducing a number of minor losses it is hoped to bring this figure down to 1.1 kWh. per kg. of liquid air. Although at low pressures only 5 to 6 per cent of the treated air is liquefied, as compared with 15 to 16 per cent with the other systems, the great advantage of the low-pressure expansion turbine system is the low capital costs and small space requirements of the plant.

Present Work

Finally, the difficulties must be emphasised of securing satisfactory and long continued operation of high-speed expansion turbines. While these difficulties may not be regarded as insuperable, they are nevertheless very formidable. It is known that attempts to develop high-speed turbines somewhat along the lines advocated by Kapitza, are being undertaken both in this country and in the U.S.A., but no published information has emerged as yet. Meantime, the large-scale plants under construction or projected in the U.S.A. are designed on the basic Linde outlines.

One fact appears certain: there are very substantial advantages to be obtained by the development of a satisfactory high-speed expansion turbine. Considerable research and development work in this country is required to determine the possibilities of such machines and the important factors in their design and operation.

At present reports from Russia continue to emphasise the important part in industry

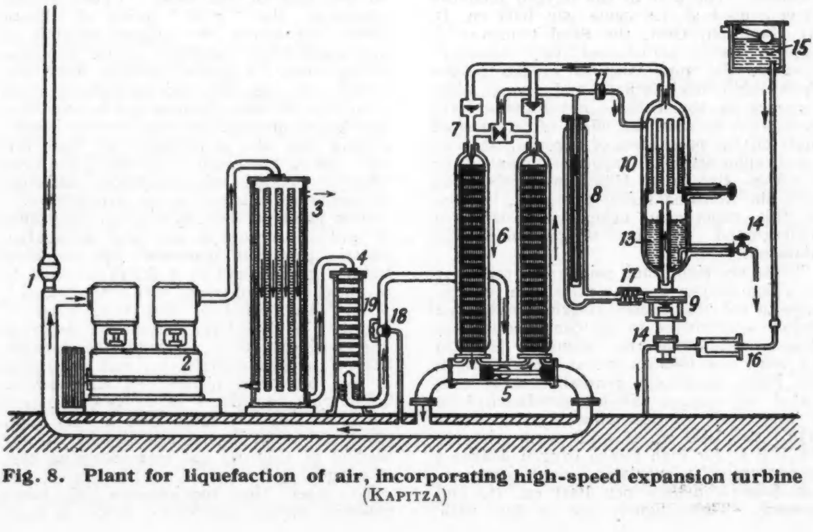


Fig. 8. Plant for liquefaction of air, incorporating high-speed expansion turbine (KAPITZA)

being played by oxygen and the great developments planned to extend the field of utilisation. Langmuir[4], in an account of an interview with Kapitza, states that a large-scale plant, estimated to cost 100 million dollars, is now under construction to provide a metallurgical plant comprising blast furnace and Bessemer, together with an auxiliary plant for oxygen manufacture using the Kapitza high-speed expansion turbine.

In this interview Kapitza indicated that overall savings of 25 to 30 per cent could be achieved in the production of pig-iron and steel by utilising oxygen-enriched air. There has been a report of a blast furnace[10] operating with enriched air up to 33 per cent oxygen, which has given 130 per cent increase in output, with a very appreciable saving in coke consumption. Experiments have also been reported on the utilisation of enriched air, up to 40 per cent oxygen, on an open-hearth furnace for steel manufacture[11]. This furnace showed an increase of approximately 50 per cent in the efficiency coefficient of heat utilisation.

Future Developments

There is every indication that very important developments will occur within the next few years in the utilisation of oxygen on a large scale. Reports have appeared[12] of the very large oxygen plant now under construction at Brownsville, Texas, to produce 48,000,000 cu. ft. of 90 per cent oxygen per day. This will be used in the partial oxidation of 68,000,000 cu. ft. of natural gas to yield petrol, diesel oil and alcohols. The cost of the oxygen produced is estimated at 4.8 cents per 1000 cu. ft. At Hamilton, Ont., the Steel Company of Canada have carried out very extensive tests on the application of oxygen to the open-hearth steel furnace and several blast furnaces in the U.S.A. and Canada have been used to test the effect of oxygenated blast on the production of pig-iron. A very novel application of oxygen is planned by the U.S. Bureau of Mines in collaboration with the Alabama Power Company, the aim of this experiment being to gasify coal underground at the Gorgas mine in Alabama.

These are significant pointers to the ways in which oxygen may be utilised on a large scale in the near future. Obviously the cost factor is dominant in all considerations of this kind. While the estimated price of 4.8 cents per 1000 cu. ft. at Brownsville is not likely to obtain generally, it is estimated that oxygen will be manufactured on a large scale at not more than 12 cents (7½d.) per 1000 cu. ft. Present prices in the U.S.A. for high purity oxygen delivered to consumers in insulated liquid containers run from 3 dollars per 1000 cu. ft. and upward. These figures are in line with those obtaining in this country which run from 12s. 6d. per 1000 cu. ft.

Considerable savings and increased output are possible when the oxygen is produced in the gaseous form at atmospheric pressure. This fact will largely determine the pattern of future plants utilising oxygen on a large scale. To enable the oxygen to be produced at the lowest cost, involving production in the gaseous state, the manufacturing plant must be situated in close proximity to the point of consumption.

Transport of liquid oxygen in insulated containers cannot offer any solution to these problems. The answer lies in the development of integrated plants with oxygen manufacturing units of adequate size included in the basic lay-out. Undoubtedly such schemes will involve very considerable capital outlay. As indicated in the estimated costs worked out previously, a plant with an output of 250,000 cu. ft. of 90 per cent oxygen per hour costs in the neighbourhood of £250,000. Capital cost does not increase in proportion to increase in capacity, a plant producing one million cu. ft. of oxygen costing little more than half a million pounds.

As shown earlier, however, depreciation, interest, repairs and maintenance, represent only about 25 to 35 per cent of the manufacturing costs, when assuming an overall figure of 15 per cent of capital costs to cover these items.

Expensive Electricity

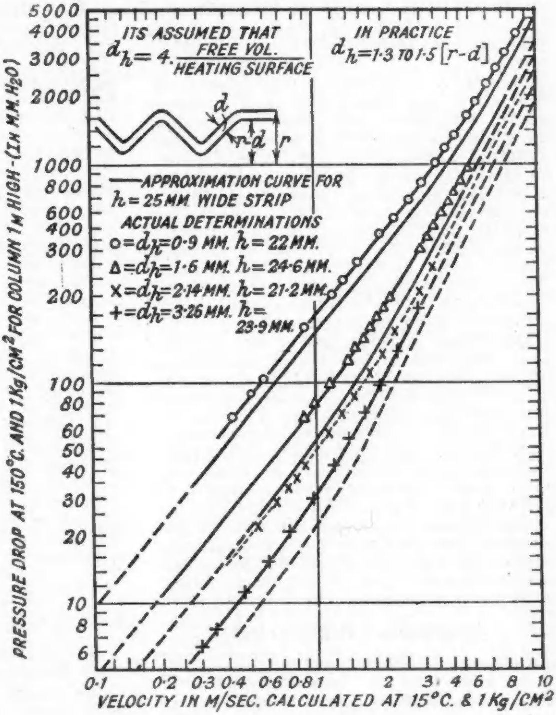
The main item in oxygen manufacturing costs is electric power, accounting for 60 to 70 per cent of the total. Under present conditions the "grid" price of electric power constitutes the biggest problem to any appreciable reduction in the manufacturing costs. A partial solution does exist however in large iron and steel plants where a surplus of blast furnace gas is available. Continental practice has conclusively demonstrated that the employment of blast furnace gas in gas engines represents the most efficient method of utilisation, although necessitating a large capital expenditure.

Few plants of this type are in existence in this country but in one large installation electric power is generated by the blast furnace gas engines at a figure believed to be about one-third to one half of the "grid" price. Any plans of this type must of necessity be long-term but should be given due consideration in assessing the possibilities of oxygen manufacture and utilisation in iron and steel plants. Of all potential large scale consumers of oxygen, the iron and steel industry must take a very high place and great importance attaches to any method of reducing the manufacturing cost of oxygen.

To meet the requirements of other potential oxygen consumers, power is most

easily obtained from the national "grid." Reduction in the manufacturing costs of oxygen depends largely on a reduction in the price of electric power. The alternative is the provision of turbo-compressors driven by high-pressure steam turbines, the method which appears to be favoured in some of the projected large-scale plants in the U.S.A. As indicated earlier, approximate costs, based on American estimates, give a figure of 8d. per 1000 cu. ft. of oxygen for steam consumption, compared with about 1s. for electric power. A saving of this magnitude may just enable manufacturing costs to be brought down to about 1s. per 1000 cu. ft.

(*Concluded*)



Graph showing the pressure drop of air flowing through the Frankl exchanger (F.I.A.T. No. 840)

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Rising U.S. Aluminium Figures

ALUMINIUM salts shipped in the United States in 1946 increased about 4 per cent in quantity and 2 per cent in value compared with 1945—states the U.S. Bureau of Mines. Producers of aluminium salts reported the shipment of 679,656 short tons valued at \$19,509,481 in 1946 compared with 652,173 tons valued at \$19,186,759 in 1945. Shipments of aluminium sulphate, the principal product of the aluminium salts industry, totalled 612,433 tons in 1946 compared with 581,441 tons in 1945, an increase of 5 per cent. Decreases were noted in the production of sodium aluminium sulphate, anhydrous aluminium chloride, and ammonia alum, and increases in the production of potash alum, sodium aluminate, liquid and crystal aluminium chloride.

German Carbon Blacks

Techniques Described in U.S. Report

GERMAN techniques for manufacturing carbon and lamp blacks from enriched gases, anthracene oil, naphthalene and acetylene are described in a report by the Office of Technical Services, U.S. Department of Commerce. A plant at Dortmund claims that anthracene residues yield 66 per cent reinforcing carbon black, suitable for synthetic rubber production. The report, which contains an evaluation of German blacks compared with Continental and United States products, was prepared by investigators for the British Intelligence Objectives Sub-Committee.

Insufficient wartime production of CK3 and CK4, said to be the best reinforcing carbon black products, forced the Germans to extend supplies by making semi-reinforcing carbon and lamp blacks. The reinforcing blacks were derived from anthracene oil and residues, naphthalene, hydrocarbon-enriched carrier gas, acetylene and, on a pilot plant scale, from a mixture of methane and oxygen. The semi-reinforcing types, inferior for rubber but valuable for printing inks, paints, lacquers, photographic and carbon papers, gramophone records and shoe polishes, were made mainly from anthracene residues and crude naphthalene.

Anthracene's Higher Yield

CK3 and CK4 were produced in quantity from anthracene at Dortmund and from naphthalene at Kalscheuren by the Degussa process. The Germans ascribe the higher yield at Dortmund to the fact that anthracene with 3-ring molecules is more aromatic than naphthalene with 2-ring molecules. The investigators felt that the use of air in the Kalscheuren naphthalene process probably accounted for the lower (48 per cent) yield of carbon black.

The Huls plant of I. G. Farbenindustrie produced wet and dry carbon blacks from by-products of acetylene manufacture by electric arc-cracking for compounding with buna S. Further development of the process is said to show considerable promise of high yields of superior blacks.

A pilot plant was under construction at Bentheim to investigate commercial production of carbon black by pressure-exploding a controlled mixture of methane and oxygen. The process, which was to be semi-continuous, consisted of the incomplete combustion of methane. The product, Hiag-Russ, was to be produced from coke oven gas saturated with light hydrocarbon vapours and was expected to compare favourably with American Micronex.

Expansion of B.S.I.R.A.

Six New Laboratories in Kent

SIX new laboratories of the British Scientific Instrument Research Association were opened at Chislehurst, Kent, last week by Mr. John Wilmot (Minister of Supply). The building that has been taken over offers greatly extended facilities in the departments of optics, chemistry and physics and adds three new fields of research—electrical instruments, electronics and mechanics. This expansion of the association's work has been made possible by an increase in the Government's grant last year from £9000 to £40,300.

Acknowledging the great contribution which the association and its chairman (for 13 years), Dr. W. H. Eccles, has made in forwarding industrial research, the Minister remarked: "No sooner does a laboratory decide to follow a particular line of research than it calls for the instruments without which it cannot execute its programme. The association has already contributed greatly to the tools and instruments which have established the good name of British workmanship in the past, and I am sure it will continue to maintain and even improve this reputation in the future."

More U.S. Carbon Black

Sir Harold Kenward, president of the Tyre Manufacturers' Conference, in a statement on the carbon black shortage, said last week that to reduce the amount of carbon black used in making a tyre would be to shorten the life of the tyre. In an effort to bring about an improvement in the supply position, he said, the British tyre industry had sent a special mission to the U.S., where they had succeeded in obtaining a promise of substantially increased supplies of carbon black He added that the improvement would take effect from next month when, provided no crisis occurred, the supply of tyres would steadily increase.

Metal Stocks and Sales

The stock of non-ferrous scrap metals on charge at May 31 amounted to 43,082 tons made up as follows: Muffled S.A.A., 2316 tons; lead and lead alloy, 1002; copper and copper alloy, 15,528; zinc and zinc alloy, 6521; other grades, 17,715. Stocks of copper and copper alloy and other grades are given as: 15,528 and 17,715 respectively. Sales for the two months' period April/May, 1947, amounted to 12,705 tons (approximate value £850,000).

World Representation at the Congress

392 Delegates from 28 Countries

DETAILS of the 392 official delegates of 28 countries among the 2000 members attending the XIth International Congress of Pure and Applied Chemistry show the following distribution, in which France predominates, after the very strong British representation of science, and official organisations: Great Britain, 144; France, 54; Italy, 41; U.S.A., 26; British Commonwealth (Australia, Canada, India, New Zealand, South Africa), 21; Netherlands, 21; Belgium, 18; Denmark, 12; Czechoslovakia, 11; Switzerland, 9; Norway, 7; Eire, 5; Jugoslavia, 5; Sweden, 3; Poland, 3; Hungary, 3; Turkey, 2; Finland, Greece, Rumania, Spain, Argentine, Uruguay and Venezuela, 1 each. The Prime Minister will be a guest and is expected to speak at the gala dinner of the congress at the Dorchester Hotel, London, on Wednesday next, July 23, the day before the congress ends. The names of the official representatives are:

Great Britain

British Association for the Advancement of Science: Dr. J. L. Simonsen; The British Ceramic Society: Mr. H. W. Webb; British Leather Manufacturers Research Association: Messrs. Ernest W. Merry, R. N. Johnson, Robert F. Innes, Ranajit Ghosh, Kenneth G. A. Pankhurst and Miss Mary Dempsey; British National Committee for Chemistry: Mr. F. W. F. Arnaud, Prof. E. C. Dodds, Prof. E. K. Rideal, Prof. C. N. Hinshelwood, Mr. H. V. Potter, Mr. F. Sproxton, Dr. G. M. Bennett, Sir Jack Drummond, Dr. A. E. Dunstan, Dr. E. V. Evans, Mr. C. S. Garland, Prof. W. E. Garner, Mr. A. Harvey, Dr. H. W. Keenan, Dr. D. T. A. Townend, Sir Ian Heilbron, Dr. L. H. Lampitt; British Plastics Federation: Mr. W. Charles Waghorne and Dr. W. E. de B. Diamond; Middlesex Hospital Medical School: Prof. E. C. Dodds; Department of Health for Scotland: Messrs. E. A. Balfour Birse and J. M. Johnston; Department of Scientific and Industrial Research: Drs. A. C. Monkhouse and A. Parker; Imperial Institute: Dr. J. R. Furlong; Institution of Gas Engineers: Messrs. H. Hollings and T. F. E. Rhead; Institution of Mechanical Engineers: Sir Ewart Smith; Institute of Metals: Mr. Stanley Robson; Institution of Mining and Metallurgy: Prof. W. R. Jones; Institute of Physics: Dr. B. P. Dudding and Mr. E. R. Davies; Lister Institute of Preventive Medicine: Drs. W. M. Morgan, M. G. Macfarlane and R. A. Kekwick; Ministry of Health: Dr. H. E. Magee; Medical Research Council: Drs. R. C. Harington, J. Walker and Harold King; National Institute for Research in Dairying: Drs. S. K. Kon and G. W. Scott Blair; Research Association of British Paint, Colour and Varnish Manufacturers: Drs. L. A. Jordan and S. H. Bell, and Messrs. C. A. Klein and P. J. Gay; Pharmaceutical Society of Great Britain: Mrs. J. K. Irvine, Prof. W. H. Linnell, and Messrs. F. W. Adams and C. W. Maplethorpe; Queen's University: Prof. A. R. J. P. Ubbelohde; Research Association of British Rubber Manufacturers: Dr. Scott and Messrs. Dawson and Wake; Rothamsted Experimental Station: Drs. Ogg and E. M. Crowther; Rowett Research Institute: Mr. D. P. Cuthbertson; Royal Society: Sir Ian Heilbron and Prof. C. N. Hinshelwood; Royal Society of Arts: Prof. C. S. Gibson and Major W. H. Cadman; Society of Chemical Industry: Dr. L. H. Lampitt, Messrs. E. B. Anderson, H. W. Cremer, M. B. Donald, F. P. Dunn, J. M. Leonard, A. V. Hussey, E. B. Maxted and S. Robson, and Profs. T. F. Heyes, G. E. Marrian and E. K. Rideal; Society of Public Analysts and other Analytical Chemists: Dr. D. W. Kent-Jones and Messrs. F. W. F. Arnaud and Norman Strafford; Science Museum: Mr. A. Barclay; St. George's Hospital Medical School: Dr. Nicholas H. Martin; Biochemical Society: Drs. Margaret M. Murray, J. H. Bushill and J. H. Birkinshaw; Imperial College of Science and Technology: Profs. H. V. A. Briscoe, Sir Alfred Egerton and Sir Ian Heilbron; Imperial College of Tropical Agriculture: Prof. F. Hardy; University of Cambridge: Profs. A. R. Todd and R. G.-W. Norrish; University of Durham: Profs. G. R Clemo and F. A. Paneth; University of Edinburgh: Prof. J. P. Kendall; University of Glasgow: Prof. J. W. Cook; University of Liverpool: Prof. A. Robertson; University of London: Sir Robert Pickard; Manchester University: Prof. E. L. Hirst; University College, Nottingham: Prof. J. M. Gulland and Mr. D. O. Jordan; University of Reading: Profs. E. A. Guggenheim and H. D. Kay; Sheffield University: Prof. R. D. Haworth; St. Thomas's Hospital Medical School: Prof. J. N. Davidson and Mr. J. Lowndes; University of Bristol: Profs. W. E. Garner, W. Baker and .T Wallace; Institution of Chemical Engineers: Messrs. H. W. Cremer, L. O. Newton, M. B. Donald, F. A. Greene, H. Griffiths, T. Penny; British Chemical Plant Manufacturers' Association: Messrs. W. R. Beswick, Brian N. Reavell, Norman Neville, E. H. T. Hoblyn; Physical Society: Profs. G. I. Finch and J. D. Bernal; Royal Photographic Society of Great Britain: Mr. F. J. Tritton; University of Wales: Mr. C. A. Edwards; Royal Society of Medicine: Sir Maurice Cassidy; Geological Society of London: Drs. A. F. Hallimond and G. W. Himus; Salters' Company: Major H. E. Stebbing and Messrs. E. Jeffery Hicks and S. Vyvian Hicks; Chemical Research Laboratory: Messrs. R. P. Linstead and V. A. Yardley, Drs. D. D. Pratt, W. H. J. Vernon, E. A. Coulson, G. R. Davies, D. V. N. Hardy, J. G. Mitchell, K. W. Pepper, E. F. G. Herington; War Office: Dr. O. H. Wansbrough-Jones; Worshipful Society of Apothecaries of London: Prof. E. C. Dodds and Dr. Roche Lynch.

Australia

University of Melbourne: Mr. A. T. Austin; University of Queensland: Mr. I. R. C. Bick; University of Sydney: Dr. Thomas Iredale; University of Western Australia: Messrs. G. L. Miles and N. E. Norman; Society of Chemical Industry of Victoria: Sir Herbert Gepp.

Canada

Chemical Institute of Canada: Prof. Paul E. Gagnon; McGill University: Prof. Robert V. V. Nicholls; Queen's University: Prof. R. C. Wallace.

India

Indian Chemical Society: Sir S. S. Bhatnagar, Sir J. C. Ghosh and Dr. K. Venkataraman; University of Bombay: Dr. K. Venkataraman; Patna University: Dr. B. P. Giyani; University of Dacca: T. P. Banerjee, S. N. Sarkar, Kjondkar Abu Md. Makarram Hussin, Majeed Ahmed.

New Zealand

New Zealand Institute of Chemistry: Mr. J. C. Smith.

South Africa

Natal University College, University of South Africa: Dr. H. A. E. Mackenzie.

Argentine

Associacion Medica Argentina: Dr. Venancio Deulofeu.

Belgium

Association Pour Les Etudes Texturales: Mr. W. Ruston; Société Chimique de Belgique: Profs. J. Timmermans and Paul Erculisse; Vlaamsche Chemische

Vereeniging : Prof. Dr. R. Breckpot and Dr. R. Stevens ; Université Catholique de Louvain : Profs. Dr. R. Breckpot and A. Castille ; State University of Ghent : Profs. J. Gillis and R. Ruyssen ; Université de Liège : Profs. J. Baudrenghien, A. Gillet, L. D'Or, V. Desreux and M. M. Renard ; Koninklijke Vlaamsche Academie voor wetenschappen, letteren en schoone kunsten van Belgie : MM. A. J. J. Van de Velde, J. Gillis, R. Ruyssen and Prof. Dr. R. Breckpot.

Czechoslovakia

Czechoslovak Chemical Works, National Corporation : Dr. George Lewi ; Czechoslovak National Research Council : Prof. J. Heyrovsky ; Czechoslovak Chemical Society : Profs. Emil Votocek, V. Vesely, O. Tomicek, J. Krepelka and Dr. J. Jelinek ; The Czechoslovak Technical University of Praha : Ing. Skalicky and Ing. Skalicka ; Ceska Akademie Ved A Umeni : Prof. J. Krepelka ; University of Mining in Ostrava: Prof. Dr. A. Glazunev.

Denmark

Danish National Council for Chemistry : Profs. R. W. Asmussen, H. Baggesgaard Rasmussen, Niels Bjerrum, J. A. Christiansen, A. Langseth, J. N. Bronsted, Stig Veibel, and MM. K. A. Jensen and Holger Jorgensen. University of Copenhagen : Profs. J. N. Bronsted, J. A. Christiansen and A. Langseth.

Eire

Irish Chemical Association : Mr. Vincent C. Barry ; University of Dublin : Mr. A. E. A. Werner ; National University of Ireland : Profs. Thomas S. Wheeler, Thomas P. Dillon and Joseph Reilly.

Finland

Finnish Academy of Sciences : Prof. Gustaf Komppa ; University of Helsinki : Prof. Gustaf Komppa.

France

Académie Nationale de Médecine : Prof. Strohl ; Académie de Pharmacie : Profs. R. Delaby, Janot, Gautier and Raoul ; Association Française de Normalisation : MM. Duval and Dionisi ; Fédération Fran,aise des Sociétés de Sciences Naturelles : Profs. Fabre and Fromageot ; Groupement Technique des Corps Gras : MM. Ripert, Sisley, J. P. Wolff, Bierre, Marroc, de Leyssac, Pierron, Salomon, Cusinberche, Jouslin, Philippeaux, Mme. Wolf, Trillaud, G. Wolf, MM. Roger Barras and Gerard Vandhuick ; Groupement Technique de la Parfumerie : MM. H. M. Gattefosse, Lagneau, Sabetay and Samuel ; Institut Français de Caoutchouc : MM. J. Le Bras and Delalande ; Institut de France : Profs. P. Jolibois and L. Hackspill ; Société Chimique de France : Profs. R. Delaby and G. Champetier ; Fédération Nationale des Associations de Chimie de France : Profs. L. Hackspill, G. Dupont, R. Fabre and R. Delaby, and MM. C. Monnet and Bienaimé ; Société de Chimie Industrielle : MM. Robert Bienaimé, Jean Gerard, De Laire, Furet, Bremond and Deschiens ; Groupement Pour l'Analyse and les Essais : MM. Marteret and Effront ; Association des Chimistes de l'Industrie Textile : M. Sack ; Société d'Encouragement pour l'Industrie Nationale : Prof. H. Gault and M. L. Pineau ; Commission Internationale des Industries Agricoles : Dr. A. B. Lindenberg ; l'Ecole Nationale Supérieure des Mines : M Rey.

Greece

The University of Thessaloniki : Prof. Const. Th. Kawassiades.

Holland

Nederlandsche Centrale Organisatie Voor Toegepast-Natuurwetenschappelijk Onderzoek : Prof. Dr. H. R. Kruyt ; Nederlandsche Chemische Vereeniging : Prof. Drs. H. R. Kruyt, C. J. van Nieuwenburg, P. E. Verkade, J. P. Wibaut, H. J. Backer, H. J. C. Tendeloo, J. H. de Boer, W. G. Burgers, Prof. D. J. Coops and Drs. G. L. Voerman and W. P. Jorissen ; University of Amsterdam : Profs. Dr. J. P. Wibaut and Dr. J. J. A. Ketelaar ; University of Groningen : Prof. Drs. H. J. Backer, F. H. L. van Os and J. J. Hermans ; Koninklijk Instituut van Ingenieurs : Dr. Ir. H. Ter Meulen ; Koninklijk Nederlandsche Akademie van Wetenshappen : Prof. Dr. H. R. Kruyt ; Nederlandsche Maatschappij Ter Bevordering Der Pharmacie : Prof. Dr. E. H. Vogelenzang and Mr. D. C. Kok.

Hungary

Hungarian Society for Natural Sciences : Prof. J. Groh ; Pazmany Peter University : Prof. J. Groh ; Magyar Gyogyszoresztudomanyi Tarsasag : MM. Istvan Molnar and Laszlo Erenyo.

Italy

Academia Nazionale dei Lincei : Francesco Giordani ; Istituto Chimico Citta Universitaria- Roma : Prof. V. Caglioti and Drs. G. Sartori, G. Giacomello and A. Malquori ; Istituto Superiore di Sanita : Profs. D. Marotta, Scipione Anselmi, Roberto Intonti, Guilio Milazzo, Francesco Toffoli ; and Drs. Maria Ester Alessandrini and Filomena Novet Nitti ; Instituti di Chimica Farmaceutica della Universita di Modena : Profs. Luigi Musajo, Alberto Spada and Alberto Tavernari, Signora Dina Spada and Ing. Franco Malvezzi ; Societa Italiana delle Scienze-Roma : Profs. Domenico Marotta, Giovanni Battista Bonino and Luigi Rolla ; Societa Chimica Italiana : Profs. Domenico Marotta, Giovanni Battista Bonino, Vincenzo Gaglioti, Livio Cambi, Grancesco Giordani, Mario Giacomo Levi, Giovanni Malquori, Emanuele Oliveri Mandala, Adolfo Quilico, Luigi Rolla and Antonio Nasini ; University of Florence : Profs. Giorgio Piccardí, Clara Bergamini, Giovanni Speroni, Giovanni Mannelli, Danilo Cozzi and Carlo Musante ; University of Genoa : Profs. Luigi Rolla and Luigi Mazza ; University of Pavia : Prof. Pietro Pratesi ; University of Torino : Prof. Antonio Nasini.

Jugoslavia

Croatian Chemical Society : Profs. Dr. K. Balenovic, Dr. H. Ivekovic, Dr. M. Karsulin, Dr. B. Tezak and Dr. R. Podhorsky ; Jugoslav Academy of Sciences and Arts : Prof. Dr. B. Tezak.

Norway

Norsk Kjemisk Selskap : Profs. Dr. Endre Berner, Dr. Ellen Gleditsch, Drs. Haakon Haraldsen, Einar Bergve and Mr. Henry Ingeberg ; Det Norske Videnskaps-Akademi I Oslo : Dr. Endre Berner and Prof. Dr. Bjarne Samdahl.

Poland

Polska Akademia Umiejetn osci : MM. Wojciech Swietoslawski, Osman Achmatowiz and Profs. Tadeusz Urbanski and Wiktor Kemula ; Polish Chemical Society : Profs. Dr. W. Swietoslawski, Dr. O. Ashmatowicz and Dr. T. Urbanski ; University of Warsaw : Prof. Dr. Wojciech Swietoslawski.

Rumania

Chemical Society of Rumania : Prof. Dr. C. Candea ; Politechnical School of Timisoara : Prof. Dr. C. Candea.

Spain

Real Academia de Ciencias : Prof. D. Antonio Rius Miro.

Sweden

Swedish Royal Academy of Sciences: Profs. George de Hevesy, Arne Tiselius and Arne Fredga ; Societe Royale des Sciences d'Upsala : Prof. Arne Fredga.

Switzerland

Conseil de la Chimie Suisie : Profs. E. Briner, P. Karrer, W. Treadwell, P. Wenger ; Drs. H. Sturm, G. Weder ; University of Geneva : Prof. Paul E. Wenger ; University of Lausanne : Profs. Dr. A. Girardet and Dr. Ch. Haenny ; University of Berne : Prof. Dr. Walter Feitknecht.

Turkey

Faculty of Science, Ankara University : Profs. Dr. Cemil Dikmen and Dr. Adolf G. Parts.

Uruguay

Asociacion de Quimica y Farmacia del Uruguay : Prof. Dr. Jose J. Cerdeiras Alonso ; Universidad de Montevideo : Prof. Dr. Jose J. Cerdeiras Alonso.

U.S.A.

American Ceramic Society : Dr. Alexander Silverman ; American Institute of Chemists : Mr. Walter J. Murphy,

(*Continued on page* 90)

American Chemical Notebook

From Our New York Correspondent

A NEW electronic detector which can safeguard the lives of miners and industrial workers by warning them of the presence of deadly gas it "hears" in the air, was described by Carl E. Crouthamel and Harvey Diehl, of Iowa State College, at a Midwest regional meeting of the American Chemical Society. The device analyses mixtures of two gases by measuring the speed of sound waves that pass through a gas-filled tube and can be attached to a dial which continuously records its measurements, or can set off a signal when the concentration of one of the gases rises above a certain limit. The electronic ear may also prove valuable in some manufacturing processes. Sound for the electronic ear is provided by an audio frequency oscillator which sends waves vibrating at 1000 to 3000 times a second through a brass tube filled with the gas mixture. A sensitive microphone at the opposite end of the tube picks up the sound waves, analyses them, and records the results on a meter, which is marked off in terms of the concentration of one of the gases.

* * *

Carbon black production and sales were in record volumes in the United States in 1946, responding to larger demand from all classes of domestic consumers and for export. Production of 1,244,421,000 lb. represented an 18 per cent increase over the 1945 record, but was below total sales, which expanded 24 per cent over 1945 to 1,269,740,000 lb. As a result, producers' stocks of carbon black declined to 76,288,000 lb. on December 31, 1946, compared with 102,005,000 lb. at the end of 1945. Furnace black production gained 22 per cent over 1945 to 625,312,000 lb. and was greater for the first time than that of contact-type blacks—619,109,000 lb. The average value of carbon black at the plants increased from 4.02c. a lb. in 1945 to 4.82c. in 1946.

* * *

Diallyl phenyl phosphonate, a new plastic material, has been developed by the Victor Chemical Company, Chicago, Illinois. The new substance—"V-Lite"—is a colourless liquid in its monomeric or original form but polymerises to become a transparent, thermosetting, hard and strong resin. Because of its flame-resistant qualities the new plastic may find its widest application as a coating for inflammable decorations or veneers. Discoverer of the new plastic is Dr. Arthur D. Toy.

* * *

In a report made public this week it was revealed that war production sulphuric acid units having a total yearly rated capacity of 991,250 tons of 100 per cent acid have been sold or leased by the War Assets Administration. They originally cost the U.S. Government 11 million dollars.

* * *

A new occupational disease, termed "delayed chemical pneumonitis," traceable to compounds of beryllium, one of the metals used in the manufacture of atomic bombs, was reported to the National Tuberculosis Association in San Francisco by Dr. Harriet L. Hardy, of the Massachusetts Department of Labour and Industries. The ailment began to be noticed about five years ago when industry found increasing use for beryllium which is extensively used in atom-smashing research and in making alloys with copper or aluminium. Dr. Hardy reported on 36 cases which occurred among workers engaged in the manufacture of fluorescent lamps from one month to four years after exposure to the compound. The patients, she said, suffered serious loss of weight and appetite, had long sieges of coughs and experienced great difficulty in breathing. Of the 36 cases, said Dr. Hardy, twelve were completely disabled, eleven partially disabled, three recovered and four showed no disease symptoms.

* * *

Plans for new plants in which synthetic substitutes for natural chicle will be made are being studied by the Barrett Division of Allied Chemical and Dye Corporation, because present facilities are inadequate to meet the large and growing demand for synthetics used in chewing gum. The substitute material—development of which is causing considerable concern in the tropical states of Chiapas, Campeche, and Quintana Roo in Mexico, where 90 per cent of the world's crop of chicle is collected—is a coal tar coumarone-indene-resin, which is now being produced at the Frankford, Pennsylvania, plant. Several other companies are also supplying the chewing gum industry with synthetics, including a petroleum resin.

* * *

Dr. Ernest O. Lawrence, Nobel prize winner and inventor of the atom-smashing cyclotron, and now at work at the University of California, announces that atoms of three additional elements—lead, bismuth and thalium—have been split by American physicists. "The splitting of these atoms," he said, "at present is only of scientific interest. It will teach us something about the nucleus of the atom but is not of practical application in making atomic bombs." The elements for which atomic fission has been achieved in the present work, are much lighter than those hitherto used.

"SHELL" TRANSPORT AND TRADING

Chemical Developments

IN the course of his annual statement, Sir Frederick Godber, chairman of the "Shell" Transport and Trading Company, Ltd., states that the chemical interests of the group have made notable progress during the year and the fruits of research have permitted further advances in the production of various chemicals from oil.

Shell Chemical Corporation's production of ammonia and ammonium sulphate in California has been extended, and further expansion is under consideration to meet the demand created by the world shortage of fertilisers. The Shell process of nitrojection, in which the ammonia is fed direct into the soil, has attracted much attention, and opened new prospects for territories not artificially irrigated. The new soil fumigant, D.D., is also full of promise for agricultural crops damaged by nematodes.

In Houston, Texas, a new plant for the production of epichlorhydrin has commenced operations and attracted considerable interest in technical circles in the United States. Other facilities completed during the year include units for the manufacture of solvents used in the manufacture of surface coatings, plastics and various other industrial materials.

New Ventures

There have also been some entirely new projects, including the construction of a large synthetic glycerine plant, using a process developed in Shell Development Company's research laboratories and a plant for the manufacture of synthetic ethyl alcohol. After careful examination of the problems and consultation with the Government and other appropriate experts, the group has now decided to embark upon the production of a range of synthetic chemicals, and a new plant in the United Kingdom for this purpose is well on the way to completion at Thornton in Cheshire.

In addition, plans are afoot to extend the company's facilities for manufacturing insecticides, fungicides and other products for use in agriculture.

The Shell synthetic soap plant, which was the first of its kind to be erected in this country, has been doubled in capacity and an entirely new plant is being built, so that the group's total production of these detergents in the United Kingdom will shortly amount to some 50,000 tons per annum. Sir Frederick says that there is no necessity for him to elaborate on the importance of this contribution in minimising to some extent the acute shortage of soap now prevailing.

All these chemicals are manufactured from petroleum and are of service to many industries, agriculture, paints, plastics, textiles and rubber, and as intermediates in the manufacture of still further important chemical products. Certain of them have not hitherto been manufactured in this country, and the production from the group's new plants will therefore form the basis of a new export trade for Great Britain.

In Holland it is intended to erect a synthetic soap plant which will operate mostly on the raw material derived from crude oil produced in Holland, but partly from imports from the Netherlands West Indies.

Research

With regard to research, Sir Frederick says that the group has always been imbued with the fundamental importance of research, and he hopes the shareholders will support the board's decision to make available large resources for these activities. The group's growing chemical interests in this country are based upon work done in the research centres at Thornton, near Stanlow, in Cheshire, at Amsterdam and at that of Shell Development Company at Emeryville, in California.

OLYMPIA EXHIBITORS

Among the firms to be represented at the Engineering and Marine Exhibition at Olympia from August 28 to September 13, are :—

The Metallizing Equipment Company (Stand 13, Row K, ground floor) who will exhibit machinery reclamation and anti-corrosive coatings; and Murex Welding Processes (Stand 11, Row E Welding Exhibition), who will be exhibiting a wide range of welding plant and equipment of the latest design.

(Continued from p. 88)

Colonel Marston T. Bogert, Drs. Gustav Egloff, M. L. Crossley and Foster Dee Snell; National Academy of Sciences : Profs. Marston T. Bogert and W. Albert Noyes and Dr. Linus Pauling ; National Research Council : Profs. Marston T. Bogert, H. F. Mark, W. A. Noyes, Linus Pauling, Alexander Silverman, Robert E. Swain, I. M. Kolthoff, Drs. Edgar Reynolds Smith, Edward Wichers, Francis J. Curtis, Walter R. Kirner, Maj.-Gen. Alden H. Waitt, Messrs. J. W. Perry, Alden H. Emery, Robert C. Swain and Foster D. Snell, W. J. Murphy ; Columbia University in the City of New York : Prof. Marston T. Bogert ; The University of Pittsburgh : Dr. Alexander Silverman : University of Minnesota : Prof. Dr. Izaak M. Kolthoff.

Venezuela

Sociedad Venezolana de Ciencias Naturales : Prof. Dr. Humberto Garcia Arocha.

CREATING WORLD CHEMICAL STANDARDS

Aims of Current Meetings of the International Union

THE 48-year-old International Union of Chemistry, whose meeting in London this week and next under the presidency of Lord Leverhulme immediately followed the centenary celebrations of the Chemical Society, is dealing with a full agenda of important work of definition. This relates to atomic weights, physico-chemical standards, chemical symbols and nomenclature, tables of physical, radio-active and other constants, supplies or stockpiles of chemicals of guaranteed purity, including rare chemicals, and much other similar work of profound interest to chemists and chemical manufacturers the world over. The Union now works integrally with the International Congress of Pure and Applied Chemistry.

Wide Objectives

In view of the supreme importance of having generally agreed standards of nomenclature and constants of world-wide currency in chemical science and industry, and the rapid advances which are being made in all branches, the need for the widest possible support of the Union by the nations is self evident. The greater the support received and the stronger its financial position, the more effectively will the Union carry out work which closely and deeply concerns every chemist and physicist, and the whole vast and varied realm of chemical industry. The Union's permanent official headquarters are at present in Paris, and, in general terms, the main purpose of the Union is to ensure continuous co-operation between chemists of member nations, to co-ordinate their scientific and technical activities, and contribute to the general advance of chemistry and of the many industries based on it.

The many problems with which it is engaged have been assigned to various commissions, some of whose reports are now being presented, supplying a basis of decisions being taken in London. Other business includes: the election of officers for the quadrennium 1947-51, the choice of country to act as host for the fifteenth conference in 1949, the increasingly difficult matter of documentation and abstracting, the question of closer affiliation with UNESCO, and the supply of new and up-to-date chemical encyclopædias or compendia of the Beilstein or Ullmann type—work of urgent necessity which was seriously impeded and prejudiced by the war.

Conflicting Nomenclature

The commission dealing with uniformity of nomenclature had a difficult task, in view of the many new elements discovered in recent years, such as technetium (43), astatine (85), francium (87), neptunium (93), americium (95), and curium (96). Some of these have been given other names, such as masurium (43), alabamine (85), and virginium (87) by other investigators.

There is also confusion in symbols: both Fr and Fa have been used for francium, and Fr has also been used for florentium (61) which is another name for illinium (61). Moreover, the element (41) is sometimes known as columbium and sometimes as niobium. The comparatively well known beryllium is also known as glucinum. In Dr. Sherwood Taylor's "Inorganic Chemistry" (8th edit. 1946) is given a complete list of names and atomic weights as established in 1941 (pp.172-3), omitting two or three of the new ones mentioned.

Tables of atomic weights have been issued annually since 1931, and the commission working on these tables, under the presidency of Prof. Baxter, of Harvard University, completed its report a few months ago. This is the 13th Atomic Weight Report.

Physico-Chemical Standards

Another commission is dealing with physico-chemical standards, having Wojciech Swietoslawski, Warsaw, as president, and working in close liaison with the International Bureau of Physico Chemical Standards established some years ago in Brussels, with Jean Timmermanns as director. Its purpose was to prepare and supply chemicals of standard purity.

It will be recalled that a UNESCO report included a reference to the supply of pure chemical compounds; and the matter has recently been under discussion between Dr. Needham, of UNESCO, and Dr. Timmermanns. The subject is being further considered at the present sessions in connection with the establishment of international research laboratories and observatories.

There may be three categories of chemicals concerned: (a) comparatively rare and not readily available, of which a collection is already being made by the Armour Research Foundation, Chicago, and by the U.S. National Research Council; (b) those well known in chemical industry, as hitherto supplied by the Timmermann laboratory and by some firms in this country; and (c) chemicals of a specially high standard of purity required for special research or metrological work where extreme quantitative accuracy is essential. (By way of example of these latter, may be mentioned water, not usually regarded as a chemical but yet one of the most important. To obtain perfectly

pure water is a difficult and complicated business, requiring much more than mere distillation.)

The Union is considering the establishment, preferably in co-operation with the Armour Research Foundation and other like bodies, of a central stock-pile of these three classes of chemicals, with headquarters, say, in Brussels, and branches in different parts of the world, on similar lines to the chain of micro-biological type culture collections already in existence.

Supply of Encyclopædias

Another matter of equal interest and importance is the compilation and supply of encyclopædic compendia and handbooks, such as Beilstein, which are indispensable to the organic chemist. It is understood that the re-issue of Beilstein has been started in Germany; but the question has been raised whether these encyclopædic works, including others like Gmelin, Ullmann, Abegg, etc., should not be subdivided into separate works. Other problems include the simplification of symbols, which Dr. Dyson has studied so thoroughly for many years, and for which he has lately proposed a new system.

These are some of the bases of the discussions which the Union initiated on Thursday, but recognition must also be given to the strong links of interest and friendship between nations that can be forged by these scientific re-unions dealing with fundamental issues of common concern to all. On this ground, therefore, as well as on the practical ground of efficient achievement of the Union's aims, it is to be earnestly wished that a measure of international collaboration in strengthening the foundations of chemical science and industry and on more general ground will be the outcome of the current meetings.

New-Type Hydraulic Power Pump

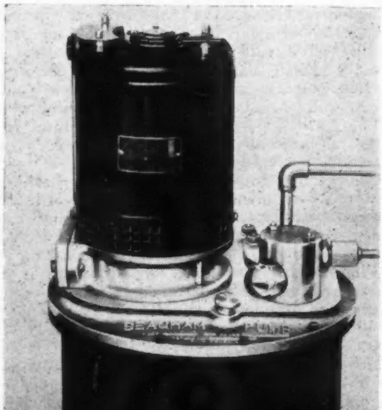
Demonstration at Caxton Hall

THERE was a large gathering of trade and technical Press representatives in the Kent Room, Caxton Hall, last week, when Oswalds & Ridgway, Ltd., demonstrated an entirely new type of hydraulic power pump, the invention of Mr. T. E. Beacham. Developing pressures up to and in excess of 3 tons per sq. in., the pump is suitable for the operation of self-contained presses, testing machines, injection moulding machines, etc.

An outstanding feature is the use of the swashplate (or conic crank) mechanism with its advantage of compactness over the often more popular parallel crank. The mechanism contains neither connecting rods, slipper, nor universal joints, the reciprocation of the plungers being obtained by direct contact between them and a single swashplate.

Possessing dynamic balance and freedom from vibration, it is claimed that it is generally unnecessary to bolt the pump to a rigid foundation. The vertical arrangement shown is considered preferable, but a horizontal layout is available for locations where a low overall height is essential. Both arrangements include filters and relief valves; in the case of the horizontal layout a reversing control valve is mounted on the side of the tank.

The manufacturers point out that while the mechanism has been particularly adapted for the purposes described above, it may well carry advantages for use with hydraulic motors, small air compressors, and refrigerating machines.



Pump and tank unit with vertical motor

POWDER METALLURGY

Progress in Great Britain Reviewed

THE interest and importance of metal powders and their products have again been emphasised by a symposium of papers published by the Iron and Steel Institute as Special Report No. 38 (1947), and forming the subject of discussion at a meeting held at the Institution of Civil Engineers on June 18-19. The papers were contributed by leading research workers in this field in this country, and at the meeting were present, by invitation of the I.S.I., representatives of the Institute of Metals, the Institutions of Mechanical Engineers, Electrical Engineers, Production Engineers and Automobile Engineers, and the Society of Chemical Industry. The papers and the discussions revealed that some progress had been made in practically all branches of powder metallurgy, particularly during the war years when the application of the new methods and products was more than ever realised and appreciated.

Historical Bases

Dr. W. D. Jones in his brief introductory historical note showed that some of the basic principles date back at least as far as 1800 in the remarkable work of Wollaston, of Johnson, Matthey & Co., Ltd., in the production of malleable platinum from the powdered metal. Sir Henry Bessemer later started the manufacture of brass powder for bronze paints in 1843. Dr. Jones was of the opinion that in recent times no fundamental contribution or invention has been made in powder metallurgy by British workers since Wollaston and Bessemer; and he is not aware of any outstanding contributions of a theoretical nature made in this country before 1939, although notable advances in closely related subjects must be credited to Beilby, Tomlinson, Hardy and others on adhesion, and to Bowden and co-workers on friction processes.

It seemed that we had lagged seriously behind the U.S.A. and Germany; but from the three papers in the symposium on developments in Germany it appeared that we have now caught up so far as that country is concerned, although still much behind America on a tonnage basis. During and since the war valuable British work has been accomplished, much of it unpublished, and at present, in addition to the comparatively few pioneer firms who have long been in the field, there are probably 50 others in Britain who are investigating commercial possibilities.

Many papers on the preparation, etc., of metal powders and products were given. Iron powders naturally occupied the principal place in the symposium, and much of Section B was devoted to their preparation, properties and test, in two valuable papers based on work in the Armament Research Department, Woolwich. Pilot plant scale production of electrolytic iron powder was described, using a 10 per cent ferrous ammonium sulphate solution at 35° C., pH 2.5, and c.d. of 200 amp./sq. ft., half the current being fed through iron anodes and half through lead anodes in porous pots. A rough estimate of cost for one ton per week was 1s. to 1s. 4d. per lb. Electrolytic reduction of ferrous hydroxide and electrodeposition followed by grinding of brittle flake formed the subject of some preliminary tests. Annealing in hydrogen proved advantageous in the first method.

Electrolytic or Oxide Reduction

The other paper from Woolwich, described the properties of 28 commercial iron powders and compacts from them, generally obtained by the electrolytic or oxide reduction method, but including also some carbonyl, abrasion, and chloride reduction powders. Much attention was devoted to methods of test and standardising tests, such as the various densities, flow behaviour, particle data, crystal structure and surface texture, as well as oxygen, hydrogen, and nitrogen content. The electrolytic iron powders were, in general, purer, softer in the annealed condition, and had slightly greater compressibility, than the oxide-reduced type, though both types varied widely.

The paper from the Murex laboratories, among the leading pioneers in powder metallurgy in this country, described briefly the various processes of metal powder production: milling, machining, atomising, granulating or shotting, graining, oxide reduction, salt reduction, electrolysis, carbonyl process, hydride process, miscellaneous; with some or all of which there may be variations. Production methods and principal characteristics of some metal powders were tabulated, including Al, Be, brass, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, Ta, Sn, TiH, W, and Zn.

The properties of flake and granular powders—aluminium, copper, bronze—were compared in another paper, which described their production using either the stamp or modified ball mill. These powders are of considerable interest to the paint industry because of their covering and leafing powers and lustre; and are used, too, in lightweight concrete, and in pyrotechnics. Risk of dust explosion in the stamping process, especially

with aluminium, is considerable, and is removed by use of an inert atmosphere.

Electrical and radio engineers and physicists found much of interest in Section C on magnetic powders and products.

Single and Complex Carbides

Another very important and interesting field of powder metallurgy, it was indicated, was to be found in the hard metal carbides (Section D) in which three papers gave practical details of production, etc., and a fourth (Drs. Sandford and Trent, of Hard Metal Tools, Ltd.) described some of the underlying principles and phenomena in the physical metallurgy of these carbides. This last was of both theoretical and practical interest. It dealt with the physical and chemical changes during sintering, of which the course was followed by microscopical determination of contraction. The principal carbides used in British industry today are WC, TiC and TaC. Complex carbides embodying VC and/or Mo_2C have been tried, and niobium carbide (NbC) has also been prepared. Methods for production of single carbides were given as direct carburisation of the metal powder, combined reduction of oxide and carburisation of metal, carburisation of alloy containing metal followed by chemical separation; and for the double carbides: heating a mixture of individual carbides, heating a mixture of oxide, carbide, and carbon, or heating a mixture of two oxides and carbon.

Dr. Sandford stated that the patent literature shows that claims have been made for use of nearly all the hard carbides, singly or in combination but that most of these have had no commercial success. Present day industrial alloys, therefore, comprised three groups: (1) tungsten carbide and cobalt, (2) tungsten and titanium carbides and cobalt, (3) tungsten, titanium, and tantalum carbides and cobalt.

The paper on the German hard metal industry included results of German researches into the structure and physical properties of hard metals and their constituents, and some account of diamond-hard metal formed from tungsten carbide and diamond powder.

OFFICIAL NOTICES

Non-Ferrous Metals

NEW prices for non-ferrous scrap metal and a reduction of £5 per ton for electrolytic copper are the subjects of Press statements by the Ministry of Supply this week. By an order (Control of Non-Ferrous Metals (No. 29) (Copper, Lead and Zinc Order, 1947), with effect from July 14, the maximum price for high conductivity electrolytic copper is reduced by £5 per ton from £137 to £132 per ton delivered. Prices for other descriptions of copper are correspondingly adjusted except in the case of black hot-rolled copper wire rods, where the new price is £138 per ton against £142 and where the margin over the copper price is now £6 per ton in place of £5. The reduction in the copper price reflects the lower price at which the Ministry is now buying copper overseas.

The premiums on a variety of copper shapes are increased by varying amounts of between 15s. and £1 10s. per ton to bring them more into line with the Ministry's costs. Some shapes not hitherto covered by order are also listed. The order also authorises the performance of pre-order contracts at the old prices. The Directorate of Non-Ferrous Metals, 20 Albert Street, Rugby, is dealing with all inquiries about the new conditions and copies of the order are obtainable from H.M. Stationery Office (1d.).

The Ministry announces also the withdrawal of the restriction whereby the issue of licences for copper, zinc and tin metal, as supplied by the Directorate of Non-Ferrous Metals, was limited in accordance with the applicant's rate of consumption, stock and forward purchases.

Thus, applicants for licences (and contracts) for these metals will in future need to give only the one guarantee that their application is against orders for their products, full allowance having been made for their intake of scrap.

Scrap Metal

The new prices of non-ferrous metallic scrap have immediate effect and will continue in force until the end of October.

Chemicals for Export

The Board of Trade announces that the following chemicals have now been released from export licensing control: Ethyl silicate, parachlor-nitrobenzene, and para-nitrophenol.

Du Pont's New Export.—The Du Pont Company has announced that its new motor body finish, "Duco" metalli-chrome nitrocellulose lacquer, is now available for overseas distribution. Up to now the shortage of raw materials and other production problems have made it impossible to accept orders for shipment outside the United States.

Technical Publications

A TIMELY publication in view of the widening uses of glycols and the present demand is the booklet "Glycols" being distributed in this country by the Carbide and Carbon Chemicals Corp. of New York. It presents in detail the properties, specifications, and uses of ethylene glycol, diethylene glycol, "Kromfax" solvent (thiodiglycol), triethylene glycol, propylene glycol, dipropylene glycol, and ethylhexanediol. It gives in 30 charts such information as physical constants, comparative evaporation rates, and solubility data and gives references of 94 technical publications dealing with glycols.

* * *

Investigations by the U.S. Bureau of Mines into mineral deposits in the western and south-western sections of the United States are described in four separate publications just released. They are: Report of Investigations 3972: "Exploration of Alunite Deposits, Marysvale, Piute County, Utah"; 3954: "Exploration of the Crowell Fluorspar Mine, Nye County, Nevada"; 3973: "Exploration of the Queen Mary Copper Project, Missoula County, Mont."; 3971: "Exploration of Barite Deposits in Montgomery County, Ark."

* * *

The U.S. Bureau of Mines publishes Report of Investigations R.I. 4071 on "Beneficiation of Beryllium Ores." Procedures have been developed for preparing commercial-grade concentrates of beryl from pegmatite ores, ranging in grade from 0.94 per cent BeO to 0.08 per cent BeO. Almost complete separation of beryl from the common pegmatite minerals, quartz, feldspar, and muscovite, as well as the less common mineral apatite, was readily accomplished by flotation; separation of the lithium minerals from beryl achieved some success.

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The U.S. Bureau of Mines has also released two separate publications on iron deposits in Washington and Texas as follows: Report on Investigations 4051: "Iron Deposits of Buckhorn Mountain, Meyers Creek Mining District, Okanogan County, Wash."; and Report of Investigations 4045, "Central Texas (Llano) Iron Deposits, Llano and Mason Counties, Tex."

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The history and physical properties of "Gammexane" insecticide (based on the Gamma isomer of benzene hexachloride) is dealt with at some length in the new "Agrocide" booklet issued by Plant Protection, Ltd.

* * *

The results of intensive research in rubber technology by the Dyestuffs Division of Imperial Chemical Industries, Ltd., on behalf of the Ministry of Supply and the Admiralty are set out in the new publications, "Identification and Investigation of Natural and Synthetic Rubbers" and "A Study of Accelerated Ageing Tests." Inquiries about these are being dealt with by the Ministry of Supply, Advisory Service on Rubber, Shell-Mex House, Strand, London, W.C.2.

Welding Research Reports

THE first (April) issue of *Welding Research*, the new official organ of the British Welding Research Association, contains interesting reports on the strength of spot welds in M.S. sheet, and on welded stanchion joints. This work was carried out at the association's research station at Abington Hall, near Cambridge.

Fatigue Loading Conditions

In the May issue the association reports on "Recommendations for the Heat Treatment of Welded Construction in Mild Steel," a description of preliminary development work on the behaviour of welded constructions under fatigue loading conditions. Although considerable attention has been paid to the subject in other countries, the work has centred mainly on the determination of fatigue strength of welded joints rather than complete structures. Some investigations, however, have been carried out in Germany and America where experience has shown that testing installations require to be substantial in size and capacity, and therefore correspondingly expensive. In the absence of such equipment, and in view of the impracticability of obtaining it, the B.W.R.A. has adopted the resonance vibration method. The report goes on to describe how four testing units have now been installed and have been found to work satisfactorily. A programme of long-term fundamental investigation is now in hand, together with a short range series of tests on constructional details of stiffened plate applicable to shipbuilding.

Heat Treatment

Another report in the same issue is entitled "Fatigue Tests by the Resonance Vibration Method on 4 Welded H-beams"; it deals with the heat treatment of welded construcions. The recommendaions put forward are based on present knowledge and experience, but it is stressed that upon completion of the present study, experimental work might well be initiated with the object of dealing in particular with the problems of local heat treatment.

Home News Items

Damar Gum. — The Board of Trade announces that, as from July 16, gum damar consigned from any country may be imported without individual import licences.

Reduced Overseas Telephone Rates.—Reduced rates now apply to telephone calls during the 24 hours on Sundays on the services with Canada, United States of America, Cuba, and Mexico.

Ice Plant for Sunderland. — The purpose of a bill which passed the committee stage in the House of Commons last week is to empower the Sunderland Corporation to construct and operate an ice factory. Supplies are at present obtained from neighbouring centres.

Shale Miners. — Shale miners in Scotland have given a lead to workers in all other industries by producing more in their new 5½-day week than in the old 6-day week, says Mr. Walter Nellies, their union secretary. He adds that he is confident that the results of the first month of the new system will be maintained.

Winter Power Prospects.—The possibility that electricity undertakings would collectively face a demand this winter for some two million kilowatts above their capacity was admitted by Sir Guy Nott-Bower, deputy secretary of the Ministry of Fuel at a Press conference in London last week. In spite of the fuel economy campaign, consumption of electricity and gas was still at a higher rate than last year.

Fire at Chemical Factory.—About 100 bags of quilla bark, which provides a chemical used in the preparation of foam fire-extinguishers, were damaged by a fire which broke out on the premises of Messrs. C. W. Field, Ltd., manufacturing chemists, Speke, Liverpool, on July 4. The City Fire Service quelled the fire, which was confined to stock in a building separated from the main factory.

New Publications.—Newly issued commercial publications on technical subjects just issued include a 20 pp. description, fully illustrated, of a number of steel cutters for a variety of purposes now made available by Protolite, Ltd., employing highly resistant "cemented carbide"; and an extremely well produced "book" describing the development and activities of B. Laporte, Ltd., the Luton chemical manufacturers. The latter provides, in addition to a very full review of manufactures and services, an interesting account of the firm's history since its inception, as a manufacturer of hydrogen peroxide, in 1888.

Works Holiday. — Messrs. Howards & Sons, Ltd., of Ilford, advise that production will be suspended at their works from July 26 to August 5, inclusive, to cover the duration of the annual holiday.

Visit to Steelworks.—Eighty members of the N. London Branch of the Institute of Welding recently were enabled to watch all the processes of steel casting at the Letchworth works of Kryn & Layh Steelfounders & Engineers, Ltd., by the courtesy of the management.

Cost of Texas Disaster.—The cost to London underwriters of insurance claims in respect of the fire and explosions at Texas City and the Monsanto Chemical Works in May is now estimated to be not less than £5 million. First American reports estimated the total insurance liability would be £12 million.

Steel and Timber Shortage.—Speaking at the annual general meeting of Harland & Wolff at Belfast on June 26, Sir Frederick E. Rebbeck, the chairman, said that the steel and timber situation was serious, and was causing delay in all directions. He deplored the decision to exclude steel for shipbuilding from the priority list, and hoped that the matter would receive early reconsideration.

Medals for Chemistry. — A prize in chemistry to commemorate the semi-jubilee of Sir James C. Irvine as principal of St. Andrews University is to be established with funds contributed by present and former students. The prize will consist of two silver medals to be awarded annually to the best students in chemistry in the United College, St. Andrews, and in University College, Dundee.

Home Enterprise in Quebec. — Durham Chemicals, Birtley, are associated with Messrs. Harrisons & Crossfield in opening a chemical manufacturing plant at Quebec, Canada. The new plant is expected to be in production within a few months and will make materials for the rubber, paint, paper and textile industries. The whole of the technical side of production will, it is understood, be controlled from Birtley.

Linseed Oil Substitute?—The prospect of a source of linseed oil substitute is held out by preliminary reports on research in Prof. Hilditch's laboratory at Liverpool University upon heat treated seeds of a West African vine. Nigeria is to send a large quantity of the seeds for research and technical trials, and the Paint Research Department of the L.M.S. Railway are also carrying out an investigation of the new material.

Personal

MR. H. C. MALLETT has been elected a director of Associated Clay Industries.

DR. R. LONG has been appointed to Birmingham University as lecturer in chemical engineering.

DR. F. SMITH, of Birmingham University, has accepted the chair of chemistry at the University of Minnesota.

MR. T. T. COCKING, chief analyst of British Drug Houses, Ltd., retired on June 30 after a 43-year period of service.

MR. H. W. PASTEUR and MR. A. GREENFIELD have been appointed to the board of J. & E. Hall, Ltd.

MR. R. W. FOOT has been appointed a director of British Tar Products in succession to Mr. G. A. Longden, who has resigned.

DR. W. B. HAWES, former chief engineer to the Wellcome Foundation, Ltd., has now become production director to A.S.P. Chemical Co., Ltd.

DR. B. EDGINGTON has been appointed chief chemical engineer to Boots Pure Drug Co., Ltd., in succession to Mr. H. Calam, who has retired.

DR. T. G. HUNTER, a member of Birmingham University engineering staff, has been appointed to the chair of chemical engineering at Sydney University.

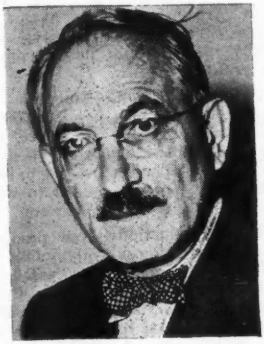
PROFESSOR W. F. K. WYNNE-JONES, professor of chemistry at University College, Dundee, has been appointed professor of physical chemistry at King's College, Durham.

MESSRS. W. N. HALL, M. W. MCCUTCHEON, M. WOOD and A. MILLER are newly-appointed directors of the Canadian Standard Chemical Co., Ltd., the company having decided to increase the board of directors from eight to twelve.

MR. S. P. CHAMBERS, a member of the Board of Inland Revenue, and until recently chief of the finance division of the Control Commission for Germany, has retired from public service to become a director of Imperial Chemical Industries.

DR. F. J. LLEWELLYN, of the chemistry department of Birmingham University, has been appointed to the chair of chemistry at Auckland (N.Z.) University College, where he succeeds Professor F. P. Worley. Only 31, Dr. Llewellyn has been lecturer in general and crystal chemistry and senior foundation Imperial Chemical Industries' Research Fellow at Birmingham University since 1945.

"Classification Systems in Relation to the Special Library," by MR. D. V. ARNOLD (Paints Division, I.C.I., Ltd.), and "Preparation and Use of Bibliographies in the Special Library," by MR. L. PATRICK (British Non-Ferrous Metals Research Association) are among principal items on the agenda of the meetings in London from August 11 to 16 of the 1947 Study Group of the Association of Special Librarians and Information Bureaux.



Prof. Selman Waksman, inventor of the new drug streptomycin, who is on a visit to this country

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Obituary

PROFESSOR A. W. STEWART, professor of chemistry at Queen's University, Belfast, died on July 2. He graduated at Glasgow University—of which his father the late Professor W. Stewart was Dean of Faculties—before proceeding to Marburg University. His appointments were: assistant to Sir William Ramsay at University College, London (1905); lecturer in organic chemistry at Queen's, Belfast (1909); lecturer in physical chemistry and radio-activity, Glasgow (1914); professor of chemistry at Queen's, Belfast (1919).

Foreign Capital for Brazil

The Brazilian Government is considering the question of employing foreign capital in the development of Brazil's natural resources, especially the participation of U.S. capital in the expansion of the oil industry; it is reported that a Bill to regulate the production, refining and distribution of petroleum is now being prepared. The oil industry of Brazil is at present controlled by the Conselho Nacional de Petroleo, and the activities of that Government Department have been largely confined to the State of Bahia. An American oil expert is reported to have stated that, whilst no extensive oilfield has yet been found in Brazil, the prospects are encouraging.

Overseas News Items

Uranium Find in Arizona.—Discovery of a large deposit of uranium-bearing ore in a deposit of carnotite has been announced by the Arizona Department of Mineral Resources. Preliminary assays show an unusually high uranium content of 1.5 per cent.

U.S. Coal £5 Ton.—American coal, of which 100,000 tons of a possible 600,000 tons allocation are expected to arrive in South Wales this month, will cost about £5 per ton delivered. The f.o.b. cost is stated to be 45s. to 50s. per ton, added to which will be freight charges of 50s. per ton.

Czech Oil Production.—New products with the properties of linseed-oil and of Chinese wool-oil will soon be processed in the Lovosice Works of the Czechoslovak Fat Factories. Castor oil-beans from South America will be used to provide raw material for the paint, varnish, textile and leather industries.

Canadian Caustic and Chlorine Plant.—Erection of a caustic soda and chlorine plant at Beauharnois, Quebec, at an estimated cost of $4,300,000 is part of a $6,300,000 expansion programme of the Dominion Tar & Chemical Co. The plant will be erected by Dominion Alkali & Chemical Co., a new wholly-owned subsidiary now being organised. The plant will have an approximate rated capacity of 60 short tons of chlorine, 67½ short tons of caustic soda, and 1¾ short tons of hydrogen.

German Radio-active Ores.—It is reported that radium-containing ores are being mined in Germany on an increased scale near Oberschlema, a spa famous for its medicinal waters. Prospecting for radium ores is also said to be in progress at Schneeberg and Marienberg. The work is in the hands of Vitriolwerke A.G., and workers in Thuringia and Saxony are said to have been sent to these localities on compulsory service, while visitors from outside are not allowed to enter them.

Chemicals Production in Berlin. — The Pfeilring-Works in Berlin, formerly Jaffe & Darmstaedter, were once well known for their lanolin, a fat product obtained from raw wool. One of their two plants is now almost completely restored and the other will be in operation before the end of the year. The firm manufactures chemical and technical household goods, soaps and polishes. Last month the firm produced 80,000 soap tablets, 100,000 pieces of shaving soap, 150,000 packets of protective cream, about 100,000 jars of cold cream and 50,000 tins of shoe polish.

Hungarian Bank Acquires Kodak Factory.—The Hungarian General Credit Bank has acquired the Kodak Factory at Vac, near Budapest, and production will soon be resumed under the new name Photo-Chemical Industry Company.

Copper Futures Again in New York.—For the first time in six years, trading in copper futures will be resumed this month on the New York Commodity Exchange, which will thus become the only " free " copper market since free trading was discontinued soon after the outbreak of war.

Electrodes from Eastern Germany.—A firm for the manufacture of superarc-electrodes has recently been founded by the Wölcke GmbH at Böhlitz, near Leipzig. In addition to covering filler metals belonging to other firms, it will soon take up the manufacture of dipped electrodes and pressed electrodes.

Hanover Trade Fair.—The first export trade fair for the display of goods produced in the joint U.S./U.K. zones of occupation in Germany will be held in the Vereinigte Leichmetall Werke factory at Laatzen from August 18 to September 7. Pharmaceuticals, chemicals and dyestuffs will be included among the exhibits.

Chilean Steel Project.—A modern steel plant is to be constructed in Conception Province, Chile, at a cost of 48,000,000 dollars. Ore from Coquimbo, 600 miles to the north of the projected plant, mined by the Bethlehem (Chile) Iron Mines, will be used as the raw material, while coal will be obtained from workings in the vicinity of the plant.

Czecho-Polish Chemical Co-operation.—Negotiations held recently in Prague have led to the conclusion of a five-year trade agreement between Czechoslovakia and Poland. It has been agreed that a delegation from the Polish chemical industry should visit Prague in order to discuss a division of the production of chemicals between the two countries to avoid unnecessary competition.

Norwegian Furnaces for India. — The Mysore Iron and Steel Works, Mysore, and the Elektrokemisk Industri of Oslo are reported to have reached an agreement regarding an expansion of the former company's plant. The plan provides for the purchase and installation of two electric furnaces of 13,000 kV each, and it is hoped to complete the work within three years, thereby making it possible to increase output from the present 50 tons to 200 tons daily from domestic ores.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

O. M. SEMAN, LTD., London, W., chemical manufacturers. (M., 19/7/47.) June 4, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; charged on Lady Margaret Laundry, Kingsbridge Crescent, Southall. *Nil. August 8, 1946.

ACE PRODUCTS (MANCHESTER), LTD., Wilmslow, chemical manufacturers. (M., 19/7/47.) June 9, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; charged on land adjoining Manchester Road, Wilmslow, and buildings, etc., thereon known as Ivyhaven & Hillside Works, certain rent charge and land and buildings, etc., thereon abutting Ladyfield Street and Ladyfield Terrace, Wilmslow. *Nil. September 20, 1946.

Company News

British Glues and Chemicals has announced a final dividend of 20 per cent on the ordinary shares, making a total distribution of 25 per cent for the year ended April 30, 1947. Net profits totalled £217,827, which is nearly double last year's figure of £109,384.

Tunnel Cement Company is paying a final dividend of 5 per cent on its ordinary shares, making a total of 25 per cent for the year, less tax, for the 15 months ended March 31. Distribution for the previous 12 months to December 31, 1945, totalled 15 per cent, less tax.

The British Aluminium Company is to redeem all of its outstanding £3,135,559 4 per cent mortgage debenture stock at 104 per cent on December 31, 1947, when it will issue £3,500,000 3 per cent mortgage debentures redeemable over 40 years. Existing holders will be invited to convert into the new stock at 100½ per cent.

Thomas de la Rue and Company, plastics manufacturers and security printers, is to raise the final dividend on its ordinary shares for the year ended March 29 by 5 per cent, thus making 50 per cent for the year as against the previous year's total of 45 per cent. Trading profit amounts to £423,952 compared with £452,570 last year.

Anglo-American Asphalt Company announces a net profit for the year just ended of £10,903, of which £7700 has been distributed as a 10 per cent interim dividend. To the balance of £3203 was added the last year carry-forward of £27,777 to make the sum of £30,980 available. A final dividend of 10 per cent has therefore been recommended.

New Companies Registered

Mine Safety Appliances Company, Ltd. (437,745). — Private company. Capital £50,000 in £1 shares. Mechanical, electrical and chemical engineers, manufacturers of and dealers in machinery, safety devices of all kinds, etc. Directors: A. J. Toering and M. L. Symington. Solicitors: Coward, Chance & Co., 3 St. James' Square, S.W.1.

Pinden Whiting Co., Ltd. (437,835).—Private company. Capital £5000 in £1 shares. Manufacturers of and dealers and workers in whiting, lime, cement, sand, plasters, pigments, chemicals, etc. Directors: R. J. Musselwhite and J. K. Musselwhite. Solicitors: Stanley Jarrett & Co., W.C.1.

Kenmak Ltd. (437,966).—Private company. Capital £5000 in £1 shares. Importers and exporters of and dealers in goods of all kinds, including dyes, dyestuffs, chemicals, paints, varnish, colours, industrial, pharmaceutical and other preparations, natural and chemical fertilisers, tanning materials, etc. Directors: F. McKenzie and J. Keighley. Secretary: May Warwick. Registered office: 11 Peter Street, Manchester.

Industrial Detergents, Ltd. (436,314).—Private company. Capital £2000 in £1 shares. Chemical manufacturers, acid and alkali manufacturers, distillers and merchants, manufacturers of and dealers in disinfectants, fertilisers, insecticides and other chemicals for domestic, agricultural or horticultural use, etc. Subscribers: A. Tame and Miss Alice E. Crozier. Solicitors: Parsons, Evans and Francis, 13 St. George Street, Hanover Square, W.1.

Chemical and Allied Stocks and Shares

BRITISH Funds have failed to hold all last week's rally but, nevertheless, stock markets were not without good industrial features, although best levels were not maintained. Business in most sections was on a fair scale, despite the continued rush of new issues. Sentiment in markets is now rather less under the influence of international uncertainties and industrial shares

are being bought as a hedge against the possibility of further inflation. Although it is recognised that the fuel position will result in lower earnings in some directions, the market is confidently expecting that many companies will benefit substantially from the abolition of E.P.T. and that higher dividends are in prospect for the current year.

Chemical and kindred shares reflected the better tendency. Imperial Chemical have rallied to 52s. 7½d., while Monsanto 5s. ordinary were 61s. 9d. Greeff-Chemicals Holdings 5s. ordinary 17s. 3d., and B. Laporte at £5 1/16 remained under the influence of the statements at the annual meeting. Fisons, however, eased to 65s., but Hardman & Holden 5s. ordinary remained active, changing hands up to 33s. 1½d. British Aluminium rose to 51s. on the big debenture conversion plan, and in other directions, De La Rue have steadied around 63s. 9d. following the raising of the dividend from 45 per cent to 50 per cent. In other directions, the units of the Distillers Co. have been active up to 153s. 6d. in anticipation of the final dividend, promised next month when the consolidated accounts are to be issued. The latter are awaited with considerable interest in the City as they will, of course, provide additional information as to the financial strength of the group, and also more details as to earning capacity, if a consolidated profit and loss account is also published. In other directions, Dunlop Rubber recovered to 79s. and there was a rise in British Drug Houses to 66s. 3d. on expectations of the shares commanding a higher relative price in their "split" form. Among other movements, Associated Cement recovered to 78s. 6d., and British Plaster Board strengthened to 31s. 6d., attention being drawn to the not unattractive yield at this level.

Movements in the iron and steel section were generally small, the big issue of the Steel Company of Wales monopolising attention, although Thomas & Baldwins have strengthened to 13s. 6d., Baldwins Holdings to 8s. 1½d., and John Summers to 29s. 6d. Elsewhere, Allied Ironfounders have improved to 69s. 6d. on the full results, and where changed, colliery shares recorded moderate gains. Tube Investments moved up to £7⅝, and among other shares, Borax Consolidated were higher at 60s. 6d., with Amalgamated Metal firm at 19s. 3d., the latter on hopes that the London Metal Exchange may be allowed to re-open later in the year.

British Glues & Chemicals 4s. ordinary have been firm at 23s. following the dividend increase, which was up to best expectations, and General Refractories 10s. ordinary shares were 25s. Moreover, Lever & Unilever at 56s. 6d. have participated well in the better tendency and Triplex Glass were better at 35s. Boots Drug were good at 67s. 3d., Sangers 37s. 6d. xd, Timothy Whites 54s. 6d., and Evans Medical shares marked 53s. 9d. Beechams 2s. 6d. deferred have been firm at 28s. the full report drawing attention to the varied interests and widespread business of the group at home and overseas. There has been considerable activity in oil shares under the stimulus of the Anglo-Iranian full report, which shows that the company's output reached a new high level and gives further news of big development plans. Anglo-Iranian were £10 5/16, Shell £5¼ and Burmah Oil 95s.

British Chemical Prices

Market Reports

THE demand for general chemicals appears to be no less active than during recent weeks, although quantities covered by delivery specifications are reported to be smaller on account of the approaching holiday season and annual shut-down of many industrial consumers. Call for shipment is not affected by these considerations, and overseas inquiries, which have been on a fair scale, have covered a wide range of products. Price changes up to the time of this report have been few and less than was expected in some quarters. There is nothing fresh to report on the coal-tar products market, prices being generally unchanged, with the demand maintained.

MANCHESTER.—Shippers have been rather prominent on the Manchester market during the past week with inquiries for a wide range of both light and heavy chemicals for overseas markets. There has also been a steady demand on home trade account, both in respect of new bookings and of contract deliveries. Firm prices continue in evidence in almost all sections. The demand for most descriptions of fertilisers is now seasonally quiet. There has been little change in the tar products sections, and pressure for deliveries of the heavy materials as well as of light distillates has been maintained.

GLASGOW.—In the Scottish chemical market there is little change to be reported. Home demands and supplies have been up to the average standard. Demand has been particularly heavy for Glauber salts and waxes of all descriptions. In the export market a number of orders have again been booked, but there is a very noticeable decrease in the number of inquiries being received. Overseas buyers are showing signs that they are no longer prepared to accept delivery dates for months ahead with a possible change of price in the meantime. It appears that American exporters in addition to being able to quote more favourable prices, are also quoting much better delivery periods.

Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each.

Complete Specifications Open to Public Inspection

Method and composition concerning stabilising halogenated organic compounds.—Mathieson Alkali Works. Nov. 27, 1945. 29905/46.

Method and composition concerning the stabilisation of halogenated organic compounds.—Mathieson Alkali Works. Nov. 27, 1945. 31831/46.

Corrosion inhibitors.—Merck and Co., Inc. Nov. 30, 1945. 34372/46.

Process and apparatus for obtaining insecticide substances in a high grade of dispersion or pulverisation, through the incorporation of carbon dioxide.—C. R. Pla. Nov. 27, 1945. 33929/46.

Co-reaction products from drying oils and copolymers of cyclopentadiene and styrene.—Resinous Products and Chemical Co. Nov. 30, 1945. 21688/46.

Copolymers of cyclopentadiene and styrene.—Resinous Products and Chemical Co. Nov. 30, 1945. 21689/46.

Production of metallic agglomerates.—Soc. D'Electro-Chimie D'Electrometallurgie, et des Acieries Electriques D'Ugine. Nov. 29, 1945. 32900/46.

Production of powdered metallic alloys.—Soc. D'Electro-Chimie, D'Electrometallurgie, et des Acieries Electriques D'Ugine. Nov. 29, 1945. 32901/46.

Isomerisation process.—Standard Oil Development Co. March 21, 1942. 12518/47.

Manufacture of surface-active agents.—Universal Oil Products Co. March 23, 1945. 12788/47.

Process for refining hydrocarbon oil.—Aktiebolaget Separator-Nobel. Dec. 8, 1945. 35913/46.

Process for the production of opium alkaloids from dry poppy straw.—Alkaloida Vegyeszeti Gyar Reszventarsasag. Sept. 19, 1945. 14062/47.

Method of and materials for finishing surfaces.—American Chemical Paint Co. Dec. 13, 1945. 36907-8/46.

Catalysts and catalytic reactions involving the employment thereof.—Baker & Co., Inc. Dec. 10, 1945. 35470/46.

Sulphur compounds. California Research Corporation. Dec. 13, 1945. 31389/46.

Method of adhesively uniting materials, especially metals, and adhesives therefor.—Ciba, Ltd. July 13, 1945. 20829-30/46.

Manufacture of piperidyl ketones.—Ciba, Ltd. July 13, 1945. 20898-99/46.

Manufacture of azo-dyestuffs.—Ciba, Ltd. Dec. 14, 1945. 36003-44/46.

Method of removing manganese from magnesium.—Dominion Magnesium, Ltd. Dec. 12, 1945. 4064/46.

Colour characteristics of polymers.—E. I. du Pont de Nemours & Co. July 13, 1945. 20878/46.

Preparation of organic chlorides.—E. I. du Pont de Nemours & Co. Dec. 14, 1945. 36805/46.

Polymerisation of chloroprene.—E. I. du paring the same.—Merck & Co., Inc. Dec. 37050/46.

Process for the manufacture of chlorine addition products of aromatic compounds.—J. R. Geigy, A.G. Dec. 12, 1945. 36524/46.

Chemical compound and processes of preparing the same.—Merck & Co., Inc. Dec. 15, 1945. 36510/46.

Chemical compound and processes for preparing the same.—Merck & Co., Inc. Dec. 15, 1945. 36511/46.

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Further particulars and forms of application may be obtained on request by post card quoting reference 287 from the High Commissioner for India, General Department, India House, Aldwych, London, W.C.2. Last date for receipt of completed applications, 8th August, 1947.

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Plant and Frame Filter Press, 19 in. square
Three C.I. Sectional Tanks
Several Ball Mills, 6 ft. 6 in. by 6 ft. 8 in., Silex-lined batch type, with driving gear and clutch
Iwel-Laab size 0 Melter, motorised
Porteous size 3 Grinder with Motor
Two set 2-pair high Breaking Rolls, 33 in. long
One 18-in. 4-roll Cake Cracking Mill
One 36-in. dia. Swan Neck Hydro Extractor
Five Large Filter Presses
One Oram Barrel Hooping Press
Rectangular Storage Tank, 128-tons capacity
Ditto, 108-tons capacity
Ditto, 62-tons capacity
Sectional ditto, 16-tons capacity
Steel Sectional ditto, 10-tons capacity
3 Johnson Horizontal Oil Filter Presses fitted 24 plates 36" diameter.
1 Ditto fitted 24 plates 36" square

Write : RICHARD SIZER LIMITED, ENGINEERS, CUBER WORKS, HULL

1000 STRONG NEW WATERPROOF APRONS, To-day's value 5s. each, Clearing at 30s. dozen. Also large quantity Filter Cloths, cheap. Wilsons. Springfield Mills Preston, Lancs. Phone 2198.

MISCELLANEOUS MACHINERY

FOR SALE

Horizontal Cast Iron **RECESSED PLATE TYPE FILTER PRESS** by Donaldson having 28 plates forming cakes 24 in. square by ⅞ in. thick, 2 in. centre feed, individual spout run off to each plate, mounted on two tie bars carried on cast iron end castings and closed by means of square thread buttress screw through hand wheel.

Overdriven **CHANGE PAN MIXER** or **WHISK**, comprising gate type mixing gear revolving in opposite directions driven through bevel wheels from fast and loose pulleys ; 15 in. diameter by 2½ in. face ; stainless steel pan 18 in. dia. by 20½ in. deep, carried on hand operated rising and falling platform.

Unused **TIMBER TANK** 3 ft. by 3 ft. by 3 ft 6 in. deep internally, sides and ends of 2½ in. thick timber and base 1½ in. thick ; four ½ in. dia. tie rods with 3 in. by ⅜ in. thick steel straps.

Single Roll **OINTMENT MILL**, having revolving pan 30 in. dia. by 5 in. deep ; marble scraper and base ; adjustable marble roller 18 in. dia. by 7 in. face ; bevel gear drive ; fast and loose pulleys.

REED BROTHERS
(Engineering) LIMITED
Bevis Marks House, London, E.C.3.

'Phone : AVEnue 1677/8

'Grams : Replant, Ald, London

FOR SALE

NEW Stainless Steel Vertical Cylindrical Tanks, 25, 50 and 100 gallon capacity, either with handles, or mounted in rubber castored cradle.
Also Stainless Steel Water-jacketed Pans with similar capacity, arranged for heating by water, oil, gas, electricity or steam.
Also Mild Steel Jacketed Pans for 50 lb. and 80 lb. working pressure, 20/300 gallons capacity.
DELIVERY from stock.
Wanted to purchase second-hand chemical plant—best prices given.

THE MANICRAFT ENGINEERING COMPANY LIMITED
Pryme Street Mills, off Chester Road, Hulme, Manchester, 15.

WANTED

ACID Sodium Sulphate (Sodium Bisulphate, Nitre Cake); regular and substantial quantities required. Write Box No. 2490, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

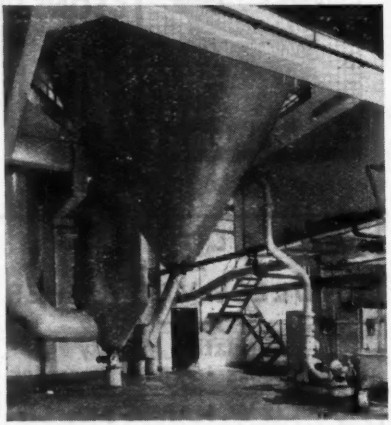
CUP Centrifuge required, preferably 3000 r.p.m. beaker capacity 800 c.cm.-1000 c.cm total, but other size would be considered. Enamelled iron plant of all description required. Price, particulars to Box No. 2498, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

INDUSTRIAL BY-PRODUCTS, LTD., 16, Philpot Lane, London, E.C.3., will be pleased to receive particulars of any by-products, waste materials and residues.

WANTED.— Supplies of Nitre Cake in ten-ton lots Box No. 2126, THE CHEMICAL AGE, 154, Fleet Street London, E.C.4.

W. PODMORE & SONS, LTD.
Caledonian Mills,
Shelton,
STOKE-ON-TRENT.

KESTNER SPRAY DRIERS



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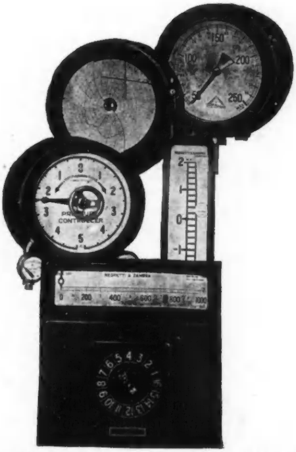

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